The NATIONAL GEOGRAPHIC MAGAZINE

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By ELIZA R. SCIDMORE

With a Series of 25 Typical Illustrations of the Far East

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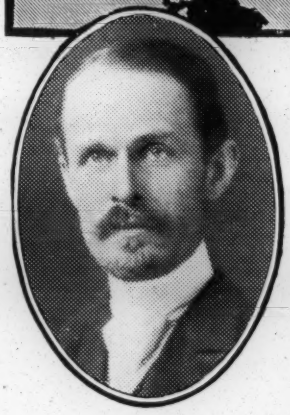

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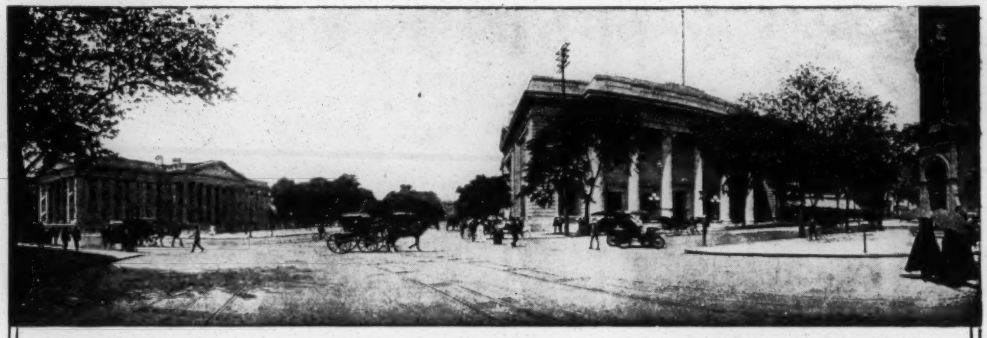

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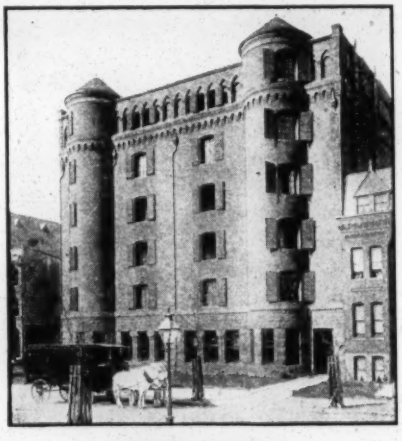

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VOL. XVIII, No. 4 WASHINGTON APRIL, 1907

THE NATIONAL GEOGRAPHIC MAGAZINE

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MILLIONS FOR MOISTURE*

An Account of the Work of the U. S. Reclamation Service

BY C. J. BLANCHARD

STATISTICIAN, U. S. RECLAMATION SERVICE

WE are living in an age of big things. It is a creative epoch. Our perspective has broadened to such an extent that it is no longer confined by fixed geographical lines. It embraces the whole world, the undiscovered Poles not excepted. It is the day of the engineer, and in no previous period of our history has he occupied so prominent a place in national affairs as he does today. The National Treasury and the surplus of huge corporations are at his command. Unafraid, he is proceeding to cut a great gash across a continent, through which the shipping of the world may pass. Eighty millions have been appropriated this year to deepen our waterways to relieve congested traffic conditions. He has tunneled the streets of our great cities for many miles to furnish readier transportation. Thousands of miles of steel are being laid to connect new regions with the nation's markets. We are today launched upon a policy of internal expansion which many have declared to be the most paternal ever attempted. Our government is actually loaning money to its citizens and making homes for them, and is loaning it as a father to a son—on long time, without interest.

On June 17, 1902, Congress enacted a law known as the National Reclamation Act. Briefly, this act provided that the money received from the sales of public lands in fourteen arid states and two territories should be used as a reclamation fund for the construction of the works necessary to irrigate arid lands in those states and territories. By wise provisions in the law this fund was made revolving. As soon as any work is completed the owners of land benefited must begin to return the cost thereof, payments being made in ten annual installments without interest. The money so returned

*An address to the National Geographic Society, March 11, 1907.

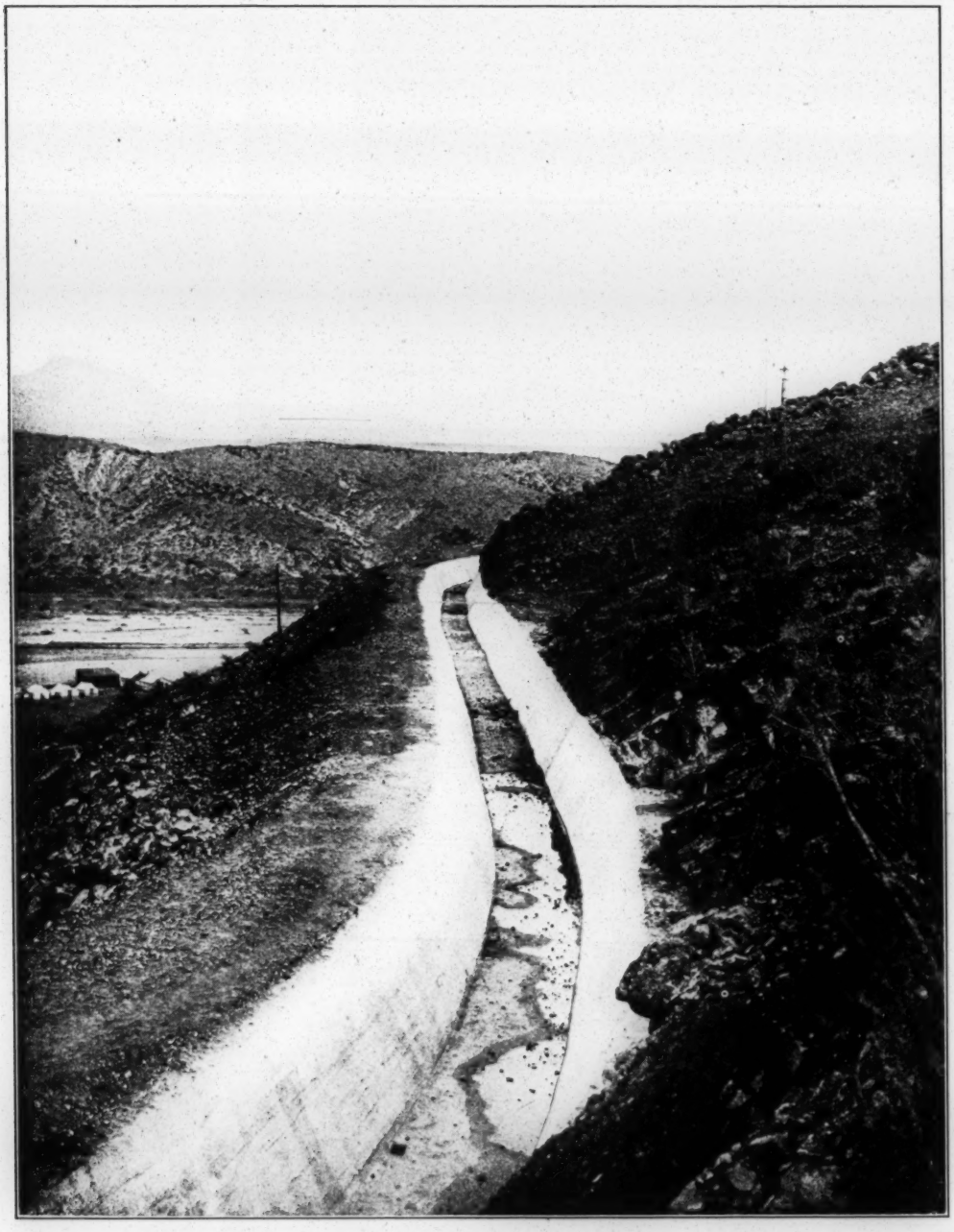
can be used over and over again in the construction of other works. To eliminate speculation and to put a stop to the greedy acquisition of large areas, it was further provided that no man could own more than 160 acres under any of these works, and such owner must actually reside upon and cultivate his land.

The policy of national irrigation is broadly paternal, yet it is so thoroughly common sense and business-like that the wonder is it was not adopted long ago. With the examples of other nations in similar works constantly before us for years, it is well nigh inexplicable that our nation, the most progressive in the world, should have been so tardy in initiating the work upon which it finally engaged less than five years ago.

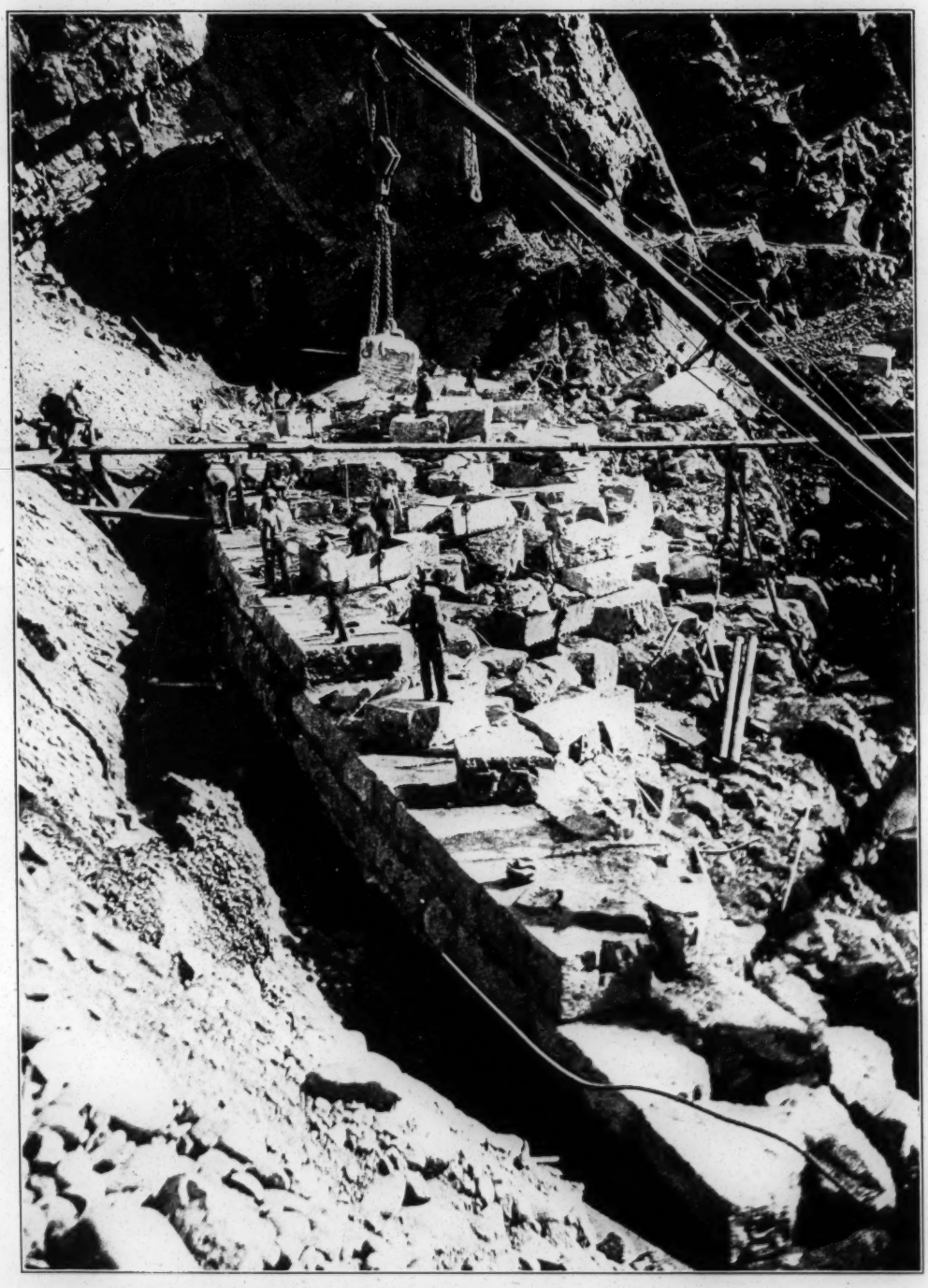
THE PROJECTS UNDER CONSTRUCTION WILL RECLAIM AN AREA EQUAL TO THE TOTAL ACREAGE IN CROPS OF CONNECTICUT, MASSACHUSETTS, NEW HAMPSHIRE, AND FLORIDA

The full importance of national reclamation is obtainable only by comparison. The twenty-five projects upon which the government is now engaged, when developed to their full extent, will add 3,198,000 acres to the crop-producing area of the United States. Add to these thirteen other projects which are held in abeyance, pending the completion of the first mentioned, and which will reclaim 3,270,000 acres, and we have a grand total of 6,468,000 acres. This enormous area today is practically worthless. It returns revenues neither to the states in which it is located, nor to the nation to which it largely belongs. It is utilized only a short period in each year for grazing nomadic herds that are driven over it. Potentially, it is the richest, the most fertile and productive land in the world, and is capable of supporting in comfort an agricultural population as dense as can be found in any of the older settled parts of our country. By expending $60,000,000 on the 25 engineering works now in process of construction, the Reclamation Service will reclaim 3,198,000 acres, or a cultivated area equal to the total acreage in crops in the four states of Connecticut, Massachusetts, New Hampshire, and Florida. The diversified crops, enormous yields from irrigated lands, and the excellent prices for all farm products in the West warrant the assumption that this land will return annually an income larger than the farmers receive in the four states named. For comparison, let us say that the revenues per acre will be the same. It is apparent, then, that this area reclaimed will each year increase the value of farm crops by $60,000,000; it will add $232,000,000 to the taxable property of the people; it will furnish homes for 80,000 families on farms and in villages and towns.

The settlement of the desert will be followed, and in some instances preceded, by the construction of hundreds of miles of railroads, of electric lines, by the development of power for manufacturing and for municipal and domestic use, by a great building movement, and by innumerable investments which accompany the creation of commonwealths. All these will aggregate millions of dollars, assuring employment for thousands of skilled and unskilled laborers, and furnishing a home market for the bulk of the products of the new farms. This immense development of agriculture in the West does not menace the prosperity of the eastern and middle western farmer. Our statistics show that nearly 80 per cent of the desert crops are forage and consumed at home. The products exported are special crops, which are in no sense competitive with eastern grown. The desert's cereal crops do not come east. The Orient has opened wide its doors for desert wheat and barley, for the various forest products, and for the output of western coal mines. Western development means additional markets for eastern manufactured products—cotton, woolens, steel and hardware, boots and shoes, and the high-grade household commodities. With the enormous increase



Power Canal on the Salt River Project in Arizona (see page 221)



Building the Foundation of the Roosevelt Dam in Arizona (see page 225)

in the demand for such articles, the manufacturers will be compelled to enlarge their plants and add to the number of their employees. Such increase will add to the demand for home-grown crops and assures the continued prosperity of the eastern farmers. Thus we see that the eastern farmer and manufacturer are both directly concerned in the work of reclaiming the great American desert. Aside from the fact that the limitless West is the safety-valve against the threatened overcrowding of the East, it is also the treasure chest from which the East may draw fat revenue for all the years to come.

$1,000,000 EXPENDED EACH MONTH

Although only four years have passed since the enactment of the law, the engineers are today employed upon the construction of twenty-five great projects in fourteen states and two territories. The expenditures average more than a million dollars a month. Three of the great projects are practically completed, and six more will be in service this summer. On many of the projects the work goes forward night and day, and the rate of progress is strikingly at variance with that at which government work usually proceeds.

There is, of course, a reason for this. The Reclamation Service is absolutely divorced from politics; it is a business organization and its motive is to build engineering works and to erect an empire in the desert.

The reclamation fund available for the 25 projects now under way amounts approximately to $33,000,000. Before these are completed it will be about $41,000,000. When this has been expended, 1,400,000 acres will have been reclaimed and will begin to return annually $4,000,000 to the fund.

The vast area in these projects and their remoteness from each other make it impossible in one short paper to describe all of these works.

SALT RIVER PROJECT IN ARIZONA

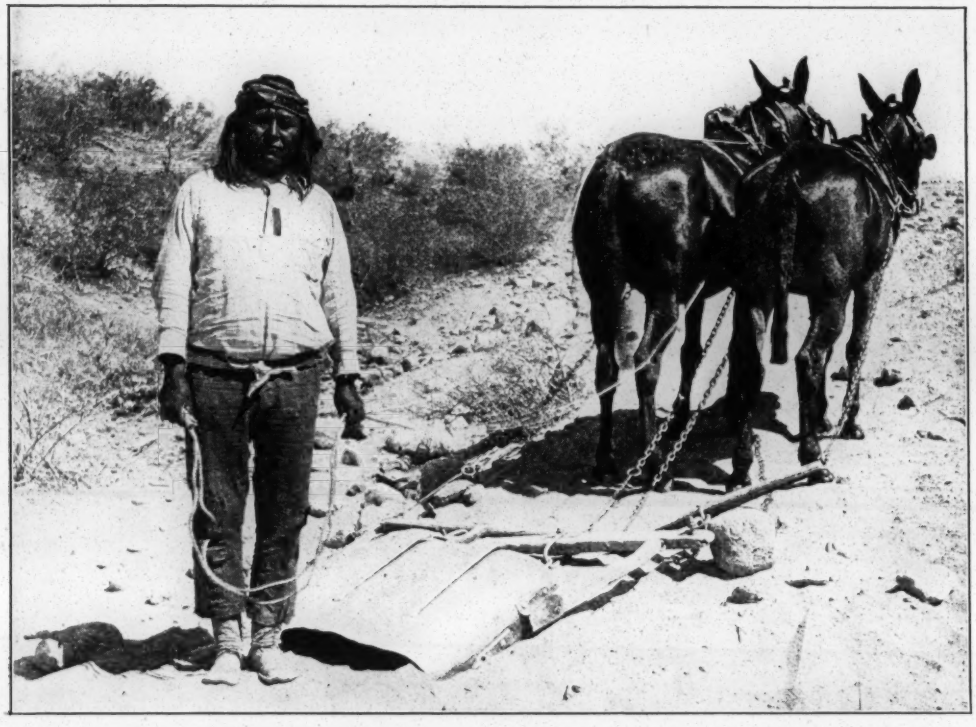
Let us go in fancy to the land of mystery, of lost races and hoary ruins, a land whose civilization was old when Rome was in the glory of its youth—Arizona.

"In that weird land, where the wild winds blowing
Sweep with a wail o'er the plains of the dead,
A ruin, ancient beyond all knowing,
Rears its head."

Antiquity is associated so seldom with things American that most of us confess to an extraordinary interest in the prehistoric on this continent. Owing to the absence of decipherable hieroglyphics and to the few poorly preserved examples of aboriginal workmanship which our ancient Americans have left us, an atmosphere of impenetrable mystery envelops the age in which they lived. Today their ruins stand alone in the desert, and the passage of time is marked in the crumbling walls or in the ancient canals, choked with the wind-swept drift of centuries.

They were the first American irrigators and their works evidence no small skill in engineering. The modern canals of today follow closely the line of their ancient ditches. A splendid compliment to the intelligence of this prehistoric race is being paid by our government in the selection of the valley in which they dwelt for the initiation of one of the greatest irrigation works ever attempted.

No national work under the Reclamation Act has attracted more general interest and none has been more widely advertised by the press than the Salt River project, surrounding the city of Phœnix, Arizona. While the engineering features are stupendous and spectacular, the charm and mystery of the region in which the work is going on appeal even more strongly to the visitor. This is the land of uncorrupted distances, of opal-tinted landscapes and perpetual sunshine. Its atmosphere is one of enchantment and its silence holds a voice of the vanished past.



A Noted Apache Chief employed on the Salt River Project (see page 226)

In the midst of a vast stretch of desert a wonderful oasis has risen, its vivid green standing out in marked contrast with the dusty plain and the distant purple hills. Three fair cities lie in the heart of this emerald island—Phœnix, Tempe, and Mesa. Their future growth and prosperity depend upon the success of the work now going on under the supervision of the Reclamation Service.

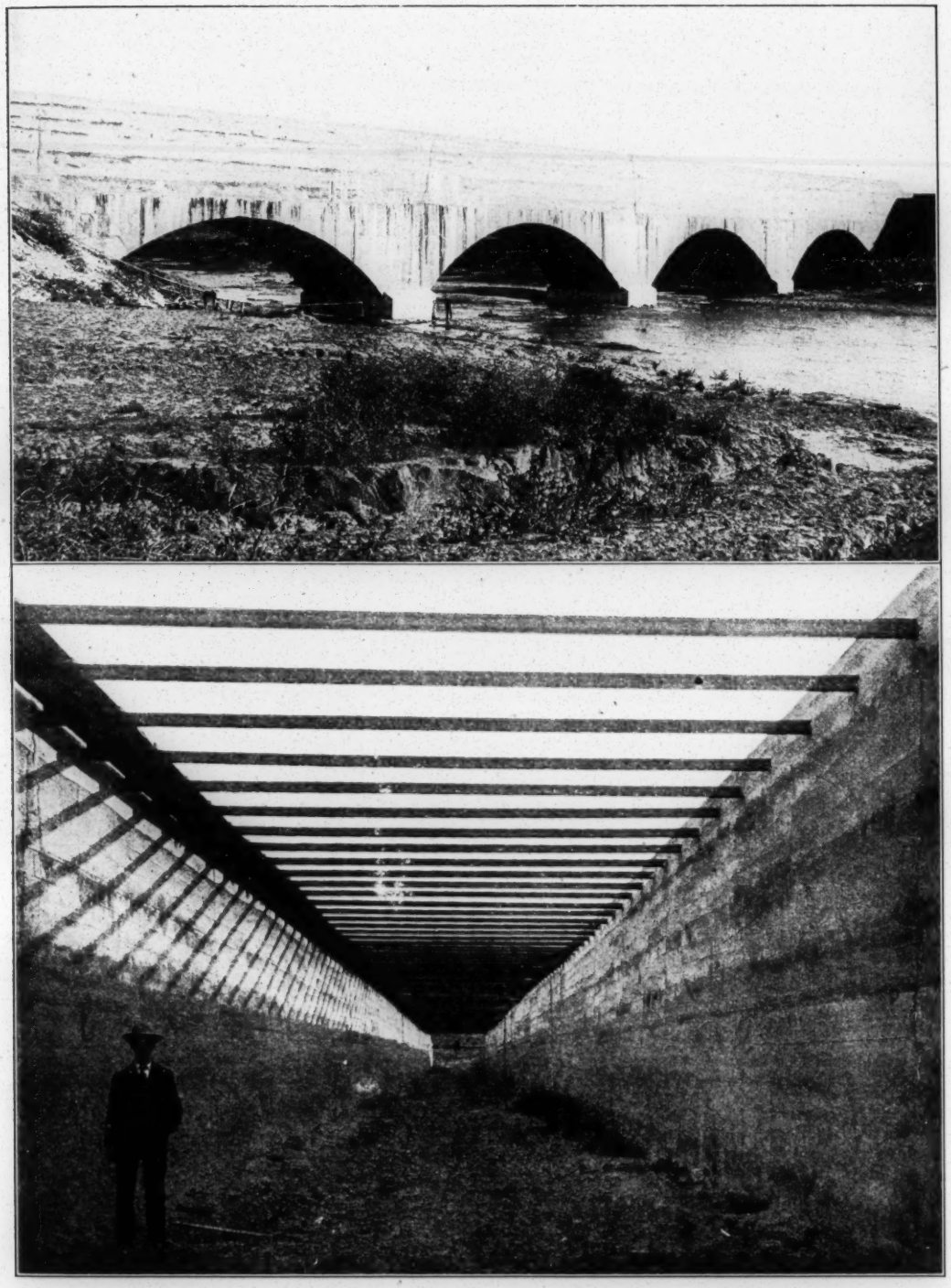
Sixty miles away from Mesa a thousand men are toiling night and day to make that growth and prosperity enduring.

Let us now enter the automobile and speed away to those distant mountains, where the silence of ages is being broken by man's machinery. It is early dawn, and eastward the summits of the hills are glowing richly red, their western faces covered with a soft, nebulous veil that trembles in the morning breeze.

For half a dozen miles we traverse a region of almost tropical luxuriance, where there is a riot of vegetation. Then, with a suddenness that is almost startling, we enter upon a wide expanse of desolation wherein the giant cactus, the gnarled and distorted mesquite, and the dusty green sage-brush are prominent features of the landscape. Every living thing bears mute evidence of a fierce battle for life. For twenty miles the government road stretches out across the plain to the foot of Superstition Mountains, which stand like desert sentinels, immutable and everlasting.

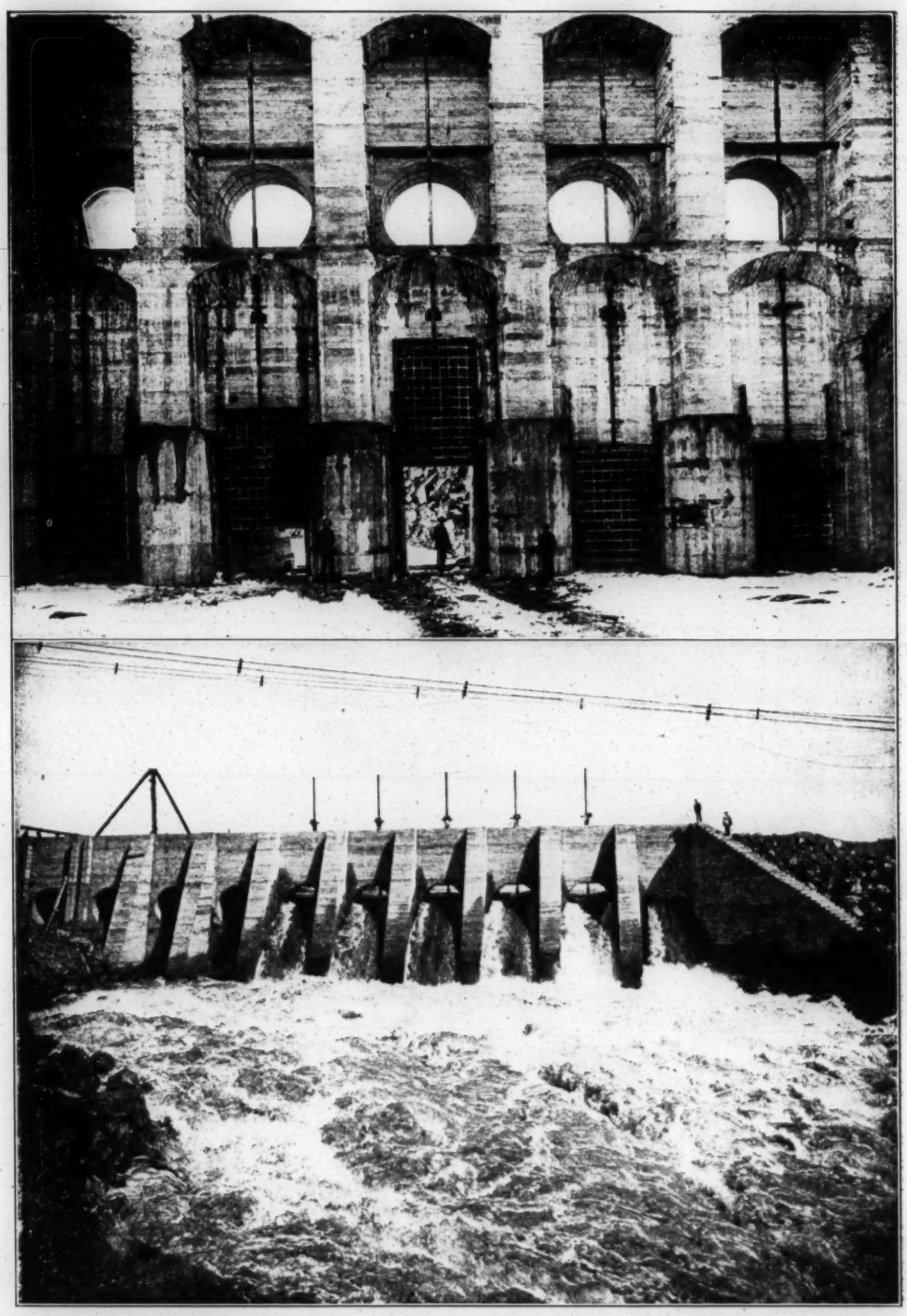
Entering the mountain area, the government road winds by easy grades up the range, affording views on every hand of wonderful beauty painted in marvelous colors.

For twenty miles we journey see-saw fashion, up and down, through a region



Concrete Flume to Carry Water Across the Pecos River, Carlsbad Project, New Mexico (see page 233)

Inside View of the Same Flume. This is the largest concrete flume in America



The Diversion Channel Dam, Upstream Face, taken from bottom of channel and showing the five 8 x 12 coffin gates, Minidoka project, Idaho

The River at Flood Flowing Through the Gates (see page 227)

of scenic wonders, until we reach the summit of Fish Creek Hill. The panorama spread out before us is indescribably beautiful. To the northward the Mazatzal Range culminates in the famous landmark, Four Peaks, 8,000 feet high. Below us a sheer thousand feet lies Frasier's Road-house, where we shall spend the night. The dwellings and stables look like toy houses. Along the edge of that dizzy cliff the road has been literally carved from solid rock. It would be simply terrifying but for the broad and comfortable roadway which we pass over. At the lower end, where Fish Creek emerges from a narrow box canyon, we cross a substantial bridge 50 feet above the stream, and then descend to the little flat on which the road-house is built.

The comfortable quarters, the excellent meals, and the inspiring scenery make this night one of delightful memory. We have slept in a canyon which a short time ago was inaccessible, a miniature Grand Canyon of the Colorado.

The climb out of Fish Creek flat to the government camp above Roosevelt is a repetition of the experience of the day before. Great cuts have been made through solid rock; at places we skirt the edge of dark chasms, at others the road seems to terminate in blind canyons. After a long swing on the brink of a profound gorge we reach the top of the mountain through which the Salt River has cut its way. Here is another inspiring view. Below us the river, like a silver thread, rushes through a deep and shadowy canyon. Looking down through a confusion of cables and wires, we see an army of men at work far below the river bed, laying massive rocks two and three tons in weight in layers of cement. The bedrock has been swept as clean as the floor of a careful housewife's kitchen, and every rock that goes into that structure is washed thoroughly before being set in place. Watchful inspectors hover about, carefully safeguarding every detail of the work.

A CITY BUILT TO BE TORN DOWN

Eastward and northward is a broad flat, across which the Salt River and Tonto Creek flow, to mingle their waters just above the mouth of the gorge. In the foreground is the bustling city of Roosevelt—a city of transient renown, for it was actually built to be torn down—a city well lighted, with its own water supply from distant mountain springs, with schools and stores—all doomed to extinction in a short year.

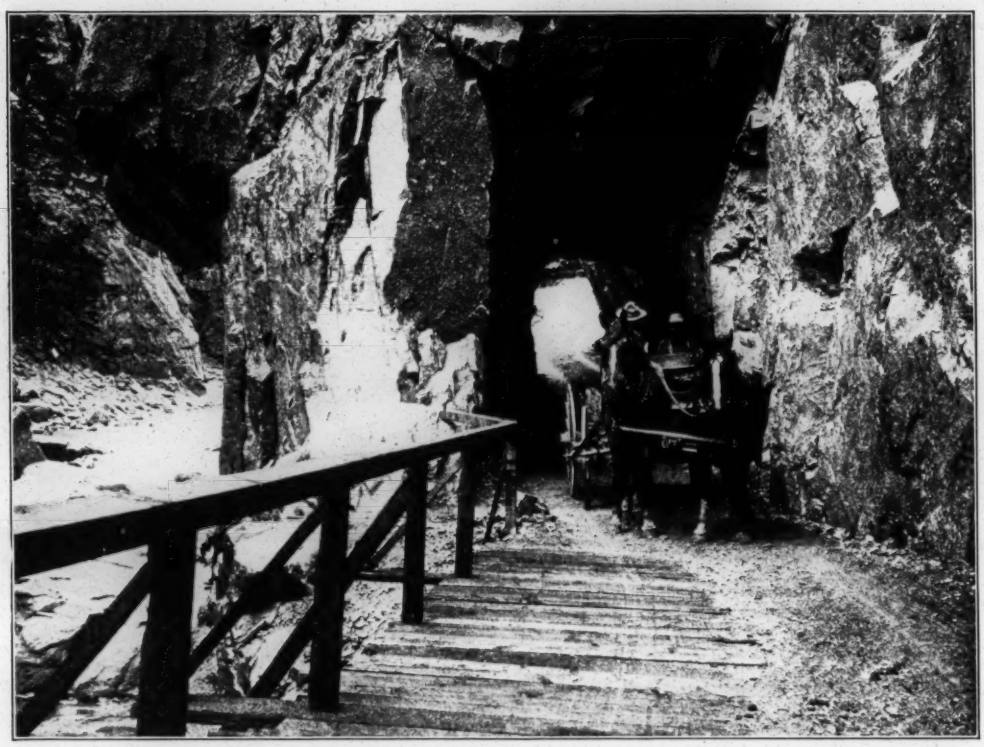
On our right the government cement mill gives noisy evidence that Uncle Sam is a manufacturer. Night and day his plant is grinding out the best cement ever made, and ere the mill has finished its work 240,000 barrels will have been used in the dam. The skips swing ceaselessly back and forth on cables from the mill down to the dam site, carrying alternate loads of cement and sand, the latter from the rock crusher just below the mill.

Several hundred feet below where we stand, in a niche cut in the solid walls of the canyon, is a power plant, utilizing a drop of 220 feet by means of a tunnel and supplying 4,000 horse-power for all purposes. It operates the mill, sand crusher, the machinery for the contractor, and affords electric light for everybody. Its supply comes from a power canal 17 miles in length, in many places lined with cement.

It is a sight never to be forgotten, to stand on this cliff at night and through the myriads of electric globes watch the busy toilers laying the huge blocks of stone.

One of the world's greatest dams is building. A beautiful curve of masonry is slowly rising in the river bed, a masonry monolith against which a turbulent river will beat itself into stillness, its foam and spume lost in a deep lake 25 miles long and 2 miles wide. In that lake the town of Roosevelt will be submerged 200 feet deep.

A quarter of a century ago this particular region was the haunt of Geronimo

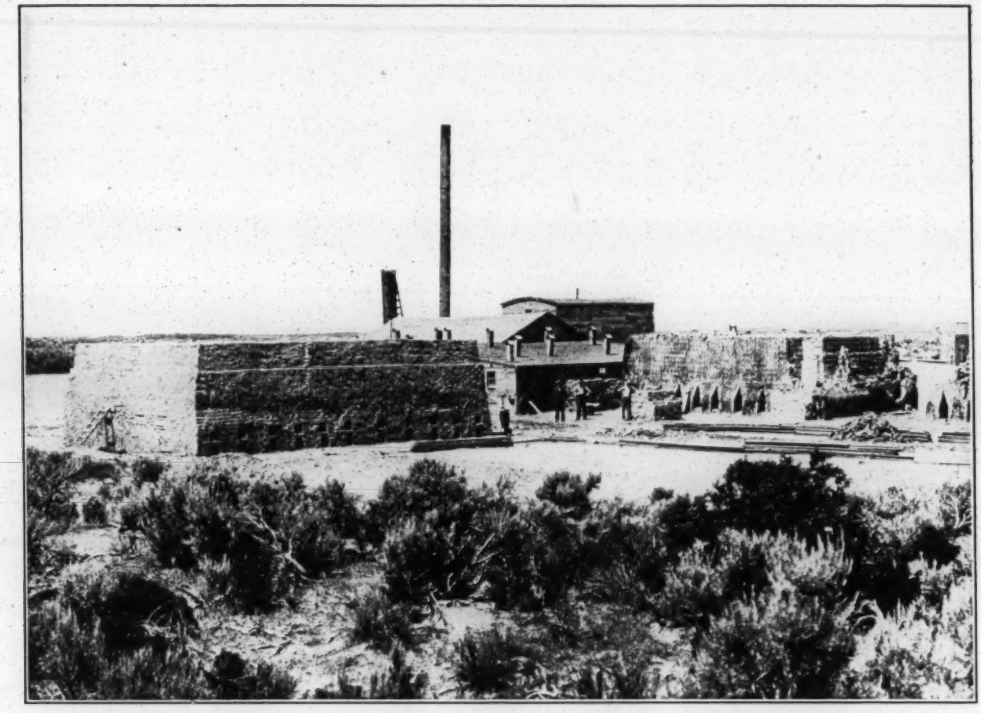


A Tunnel on the Government Road to the Shoshone Dam (see page 223)

and his band of murderous Apaches. The big chief has been exiled, but his people still live here. Owing to the scarcity of labor, the supervising engineer turned missionary and held a pow-wow with the Indians. Such was his eloquence that several hundred Indians went on the government pay-roll. They proved to be good workers and were in no small degree responsible for the prompt construction of the Roosevelt road. Later on they were tried on canal work and on concrete mixing, and were not found wanting. While the head of the family toiled for the government, the squaw in her wickiup wove wonderful baskets, which found ready sale in the camps and in Roosevelt. Poor Lo as a worker is no longer a joke. He has discarded the gay-colored robe, the paint and feathers, and in sweat-shop jumper and blue jeans is earning his living by the sweat of his brow. What justice could be more poetic than that his arrows and hatchets should be turned into picks and shovels and his labor utilized to bring the precious water to the land which he had so often enriched with the blood of the white man.

In 1908 Roosevelt dam will be completed. Its height will be 286 feet. On top it will be 800 feet long. It will create the largest artificial lake in the world and will furnish 200,000 acres of land with water. The cost of the entire project will be approximately $6,500,000.

On several of the projects the work has reached the point where the human interests involved overshadow in importance the engineering features. The most intensely interesting period in the work of reclamation is at hand—the landless man has been brought to the manless land. It has been well said that he who helps to establish the security of the



The Barker Brick Company, Heyburn, Idaho

Three years ago, when the government irrigation works were started here, there was not a house within 30 miles (see below)

irrigable home will also help to establish that greater, that composite home, the United States of America. Our nation is indeed affected by this problem which the Reclamation Service is on the eve of solving, for on the success of the irrigable home rests today the prosperity and stability of more than one western state.

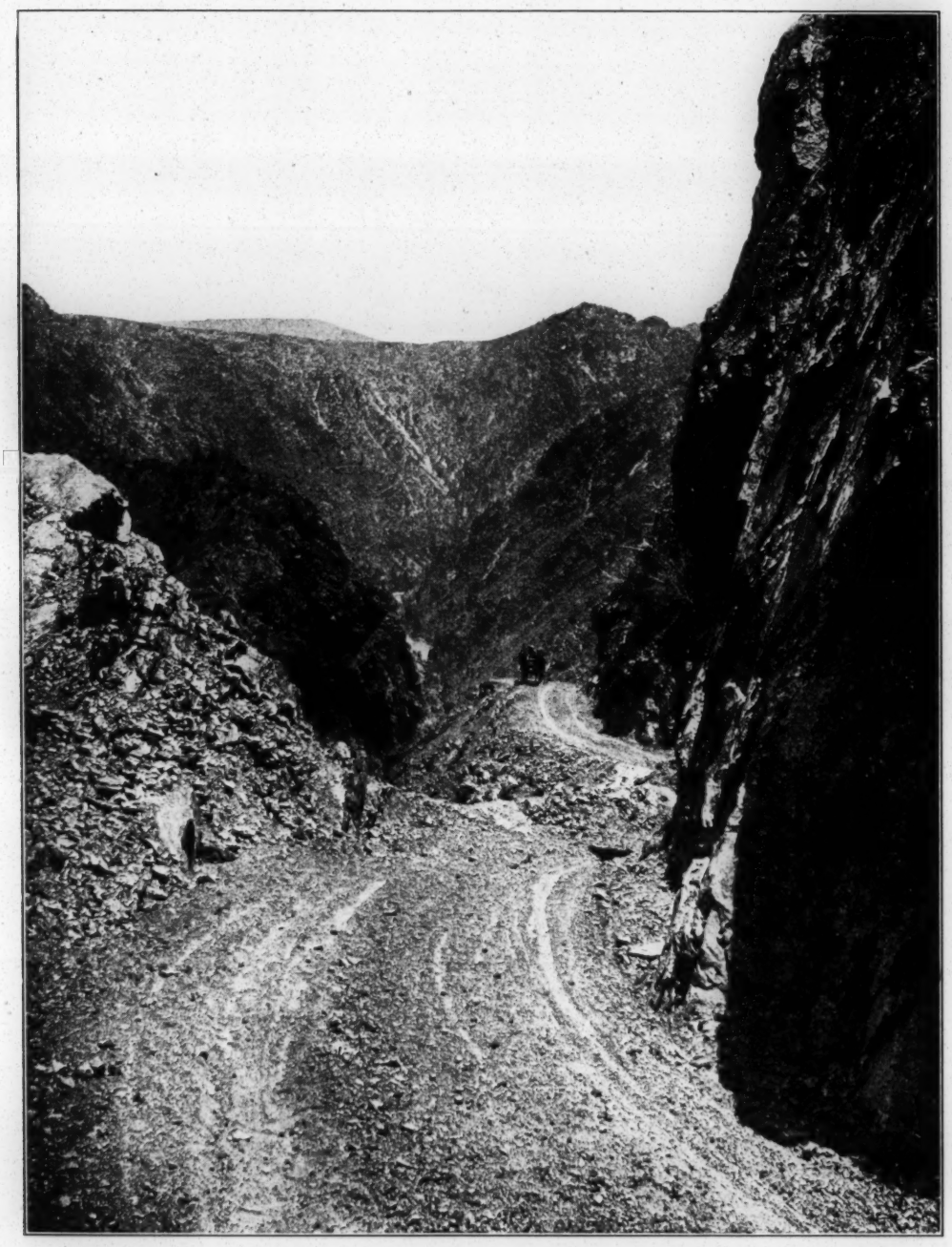
A REMARKABLE TRANSFORMATION

In March, 1903, a party of surveyors ran their lines over a vast, unbroken, uninhabited plain in southern Idaho, comprising 150,000 acres of sage-brush. It was a most uninviting and unattractive region. After the surveyors, came the engineers. In turn they were followed by the contractors. The desert's awful stillness was broken by the shrill whistle of engines, by the creaking of giant cranes, and the voices of hundreds of laborers. Attracted by these evidences that Uncle Sam was about to do battle with the desert, scores of home-seekers flocked to the scene and began to erect their homes in the desert. The transformation which has followed the advent of that little band of surveyors is so remarkable that one is led to believe that Uncle Sam, in the rôle of Aladdin, rubbed the magic lamp and the desert vanished.

In 1904 the Minidoka project had not a single inhabitant; today it contains more than 4,000 people; it has three thriving towns, a railway, schools, newspapers. Every eighty acres of that vast desert has a dwelling upon it with a family living in it. Lands only a short time ago counted as worthless are now valued at from $40 to $75 per acre. On August, 1904, a contract was let for the con-

Timbering in the West End of the Gunnison Tunnel.

The government engineers who drove this tunnel won the world's record for the distance driven in one month (see page 234)



The Newly Constructed Government Road Up the Gunnison Canyon

The road in places has grades out of the canyon of 24 per cent (see page 234)

struction of the principal engineering work, a rock-fill dam. This structure was located about 8 miles southwest of Minidoka, at a point where the channel of the river has been crossed by recurring lava flows. A ridge of lava probably extended entirely across the river channel at this point and the river cut a narrow way through it. The purposes of the dam are mainly control, diversion, and power development. In constructing the dam the diversion channel was first built. Two separate masses of fill, the upper one of earth and the lower one of rock, about 150 feet apart, were extended across the river from shore to shore. As the natural channel was thus gradually closed, the water was backed up and compelled to flow through the diversion channel. The line of rock-fill was deposited from a cable-way, the earth-fill being put in place by means of dump-cars and trestle-work. Between the two masses of fill a concrete core wall, built up from bed-rock, was extended across the river. The headworks contain nine gates each 5 feet wide by 7 feet high, and the controlling works contain five gates each 8 by 12 feet. The dam is 80 feet high and 625 feet long; on top it is 25 feet wide. Its volume is about 190,000 cubic yards. It was completed in September, 1906. The natural conditions are favorable for the development of power, and from 11,000 to 30,000 horse-power will be available for the people who dwell under the project, an asset the value of which can scarcely be overestimated. The canal system, to be in operation this year, is more than 100 miles in length and will cover 60,000 acres.

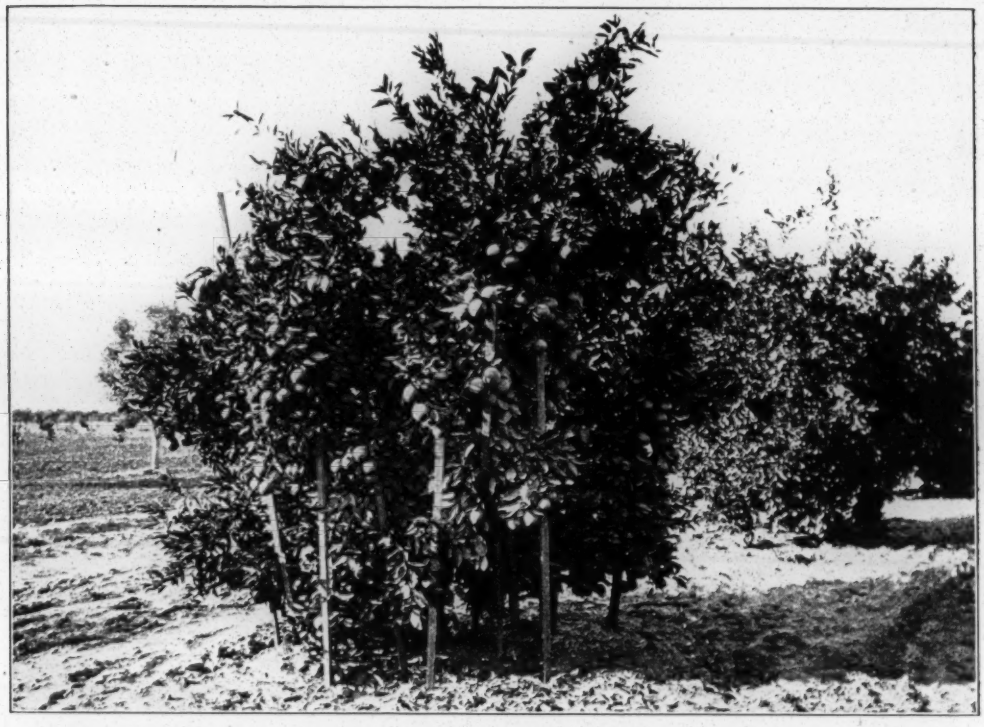
THE WONDERFUL YAKIMA VALLEY

Redlands and Riverside of southern California have their rivals in the Northwest in the wonderful Yakima Valley, in Washington. Those who find the perpetual summer of the Southwest too enervating will be attracted to this remarkable region, which has so recently come into prominence by reason of its surprising fertility and the diversity and superior quality of its products.

Naturally this region was not overlooked by the Service. Today construction is under way which when fully concluded will bring approximately 400,000 acres under ditch. The crop yields in this valley are almost incredible, and, as a result, agricultural lands have as high average value here as anywhere in this country, California orange lands not excepted. Two thousand dollars per acre for orchard land is not an uncommon price. We need not wonder at such sales when these apple orchards frequently yield 1,470 boxes per acre, which sell for $1.25 per box, or $1,737 per acre. The hay crop is an important one. The valley potatoes bring an annual income of $1,000,000 to the farmers. Hops yield from $300 to $600 per acre. Yakima apples and hops sell well in the New York markets, and are exported in large quantities.

The Yakima project is in several units which ultimately will be combined in one great system, embracing 400,000 acres, every acre of which, with an assured water supply, will be worth not less than $100. The government's plans involve an expenditure of about $13,000,000 in canals and ditches and in storage dams to hold back the flood waters of the Yakima drainage in several mountain lakes.

Our desert region is the only section of our imperial country wherein there is an equality of opportunity. In no other part of the nation are the rewards for individual effort more certain and constant. When these facts are more fully realized, the wisdom of President Roosevelt's policy of safeguarding and conserving this vast estate for the people will be appreciated. America has furnished a safety-valve against the overcrowding of the great centers of population in the Old World for 50 years. Is it not about time to look to our problem and prepare against the day when there shall be a glut of population in our own cities? Thoughtful men are predicting a popula-



An Orange Orchard at Riverside, California, the Product of Private Irrigation

tion of 200,000,000 in 1950 and 300,000,000 at the close of the century. How shall we take care of this vast increase?

There is a land hunger even now that is hard to satisfy. Many thousands of our best people are flocking to Canada every year, attracted by the cheap lands of the Northwest Territory. Every acre of our remaining public domain should be reserved for the *bona fide* homeseeker.

WORK IN NEW MEXICO

In the range of resources, in the charm and healthfulness of her climate, and in the fertility of her soil, New Mexico typifies the arid region. It has been found possible for the Reclamation Service to undertake the construction of three projects within her borders.

The greatest of these, the Rio Grande project, is especially interesting, as it involves international and interstate features in unusual combination. The project is today the subject of a treaty with Mexico, and our Congress has just done tardy justice to a friendly neighbor by appropriating $1,000,000 in recognition of a debt long overdue.

The Rio Grande Valley is rich in historical incident. Long before the Puritan fathers landed upon the bleak and inhospitable shores of New England, thrifty husbandmen irrigated the fertile bottoms along the lower valley in New Mexico, Texas, and Old Mexico. Primitive as were their methods of agriculture, they sufficed to sustain a dense population in peace and contentment. Strangely, too, their communal system of farming, with homes in the pueblos and small cultivated areas near by, is essentially being adopted by our later civilization as best adapted to desert conditions. It removes the isolation of the lonely ranch, makes possible social and

A Field of Barley in the Yuma Valley, Arizona, probably the most productive region of the United States (see page 237)

educational advantages, and tends to the economical and most profitable methods of farming. Small farms, carefully and scientifically tilled, make compact communities, which enjoy graded schools and the luxuries and comforts of towns with the freedom and pure air of the country.

The principal feature of this project is the Engle dam, about 100 miles north of El Paso, Texas. It is to be a huge structure of masonry 255 feet high, 400 feet long on the bottom, and 1,150 feet long on the top. This dam will impound 2,000,000 acre-feet of water, or nearly double the amount stored by the Roosevelt dam. It will check the greatest flood ever known on the Rio Grande and will supply 180,000 acres in New Mexico, Texas, and Old Mexico. The estimated cost of the entire project is $7,200,000. One million dollars of this amount has already been appropriated by Congress to meet the proportionate cost of the works required to irrigate the lands in Mexico. These lands were formerly irrigated by canals taken from the river in Old Mexico, but the extensive diversions in Colorado and New Mexico finally rendered these canals useless, and the land went back to desert.

The Hondo project, near Roswell, New Mexico, now almost completed, provides for the storage of the flood flow of the Rio Hondo in a natural depression and supplies 10,000 acres of land.

The Carlsbad project was undertaken by the Service to save from destruction the property of settlers near Carlsbad. A great flood destroyed the irrigation works in the valley, and the valuable orchards and cultivated fields would have returned to desert but for the coming of the government. About 20,000 acres are embraced in this project, which involves an expenditure of $650,000, and will be completed in 1908. It will irrigate a considerable acreage next spring.

IN MONTANA AND WYOMING

There will be an opportunity for homeseekers to secure choice farms in western Montana next summer, when the Huntley project is formally opened. About 35,000 acres are involved in this project and the lands are exceedingly desirable. As this project is in the ceded portion of the Crow Indian reservation, no settlers have been permitted to locate thereon and the formal opening next summer promises to be somewhat spectacular.

Across the line, in Wyoming, is the great Shoshone project, involving several difficult engineering feats. In the narrowest part of the Shoshone Canyon a wonderful dam is beginning to rise above the river bed. In height it tops every other structure of the kind in the world. It will be a narrow wedge, 85 feet across the bottom, 200 feet long on top, and 310 feet high, and will block the canyon. To reach the dam site it was necessary to construct a road through an inaccessible gorge. On this road are several tunnels through rock cliffs, and for several miles the road is in rock cuts. It opens a new and very attractive scenic route to the National Yellowstone Park.

Below the city of Cody, Wyoming, a diversion dam is being constructed in the river, and the stream is to be diverted into a great tunnel three miles long, passing under an elevated plateau. From the lower end of the tunnel canals extending all over the valley will carry the water to 180,000 acres.

TUNNELING A MOUNTAIN—A WORLD'S RECORD

The Uncompahgre project, in Colorado, in many respects has presented more difficult problems than any other work undertaken by the Service. The engineers from the very first step have encountered trouble. The topography of the country is probably the roughest in the United States. Here was a canyon through which no man had ever passed. It was necessary to explore it in order to locate a site for a tunnel. An engineer and an assistant made the attempt, and after incredible hardships succeeded. The topographers who followed to complete

the surveys experienced unheard-of trials, but they too accomplished their task. Then a road into this frightful gorge was constructed—a remarkable road, with grades out of the canyon 24 per cent in places. Heavy machinery was brought in and a power plant was installed. River Portal became a village with a store, a school, a public reading-room, machine shops, cottages, and a hospital. Three crews of men, each working 8 hours a day, were set to work in the canyon, driving a tunnel under a mountain 2,000 feet high. This tunnel is to furnish an underground waterway, with cross-section of 10½ by 11½ feet and nearly 6 miles long, to carry the waters of the Gunnison River into the Uncompahgre Valley. Simultaneously other crews began the same work on the other side of the mountain, and night and day the drills were kept boring into the rock and shale, each crew vying with the other to achieve a record. For a time work was carried on from four headings. The tunnel has been driven 18,000 feet, or 3½ miles, to date. A world's record has been made, 823 feet having been driven in one month. The records on the Simplon Tunnel, in the Alps, do not equal this. One gang of laborers drove over 7,500 feet in one year.

Gas, cave-ins, and subterranean springs have all interposed difficulties requiring the utmost care in the prosecution of the work. While the excavation was going on, many miles of canal have been dug, some of which are in exceedingly unfavorable country.

The Uncompahgre Valley has a general elevation of 5,000 feet, but owing to the lofty ranges of mountains which surround it, the climate is mild and equable. The soil of the valley is of unusual fertility, and this section is noted for its fine fruits.

AN INTERNATIONAL COMPLICATION

Up in northern Montana, close to the International Boundary, the engineers of the Reclamation Service are wrestling with what is known as the Milk River project. One of the problems on this project is to divert the waters of the stream which rises in this country, but empties into Hudson Bay, and utilize the same on lands in one of our own valleys. There are some rather delicate international features connected with this scheme which the diplomats of the two countries are endeavoring to adjust.

Briefly, the plans provide for the taking of the waters of Saint Mary River across the low divide into the North Fork of Milk River. Milk River rises in Montana, flows northward across the boundary into Canada, continuing in that country for 200 miles, and then turns southward into Montana again, emptying finally into the Missouri River. Our Canadian neighbors are already using the waters of both of these streams for irrigation and an endeavor is being made to settle the questions of water rights. The first work on this project will be the construction of a dam in Saint Mary River near Lower Saint Mary Lake and a canal 37 miles long to carry the water into Milk River. Considerable work has been done on the canal, and on this work a number of Blackfeet Indians have been employed. This region is one of unusual scenic beauty. The mountains are rugged, of great elevation, and contain a number of the largest glaciers in the United States. There are several beautiful lakes and waterfalls in this vicinity.

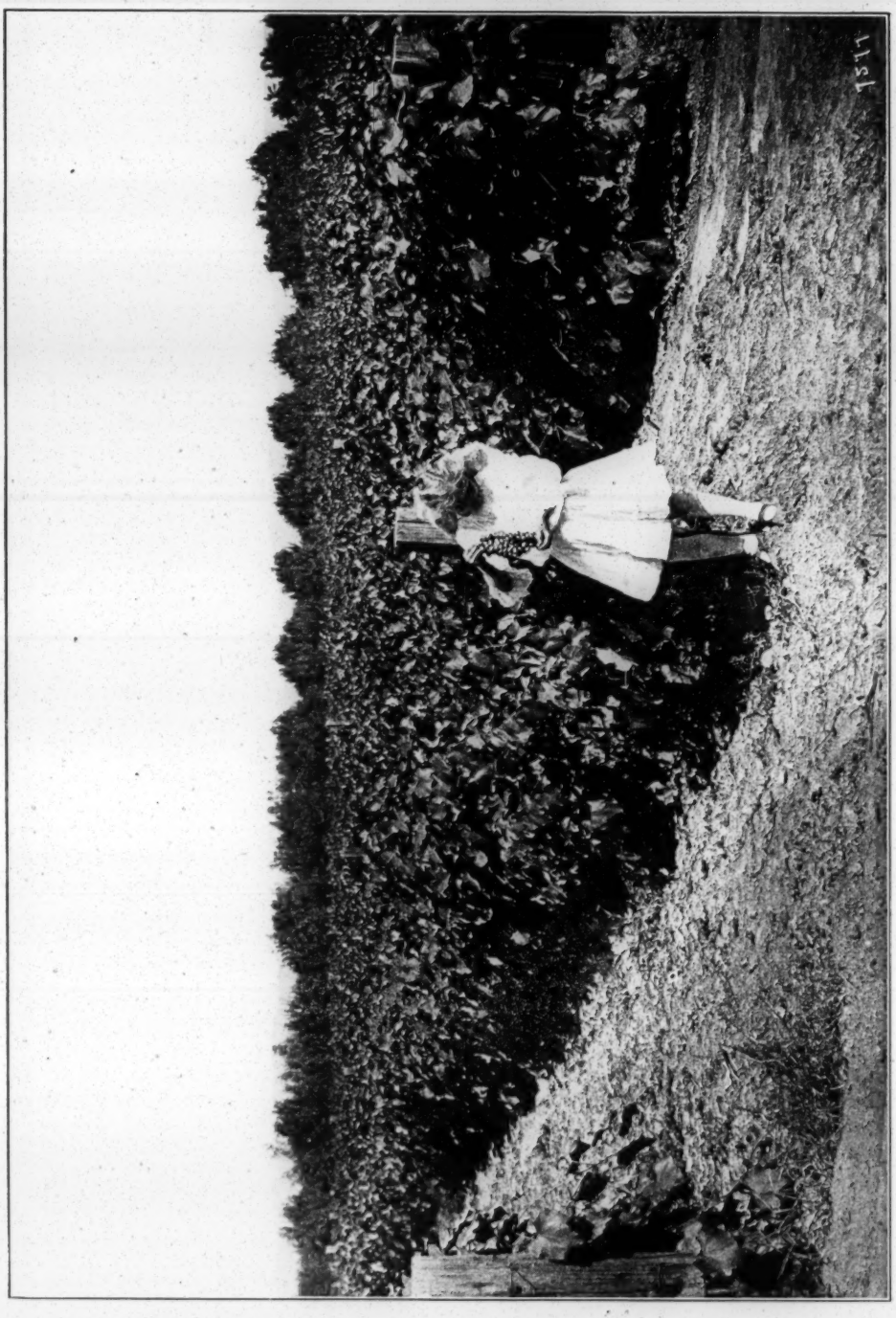
A UNIQUE PROJECT

A rather unique irrigation project is located partly in southwestern Oregon and partly in northern California. This is called the Klamath project, and involves problems of irrigation and drainage in unusual combinations. It is proposed to drain partly two lakes and to irrigate their exposed beds from water drawn from Upper Klamath Lake. About 180,000 acres of land will be reclaimed by this project, some 20,000 acres of which will be watered next spring.

The Yuma project, which embraces

Before Irrigation—The Sage Brush Desert, Yakima Valley

After Irrigation—The Same Land Devoted to Strawberry Culture and Valued at $500 per Acre



A Vineyard in the Yakima Valley

First Cutting of Alfalfa on Reclaimed Land—4 tons to the acre—Yakima Valley

lands in California and Arizona, has been the subject of a presidential message to this Congress. This is the region often called the "Egypt of America," and in climate, soil, and crops it bears a singular resemblance to the fertile valley of the Nile. The government is engaged upon the construction of a great dam across the Colorado River about 12 miles north of Yuma. This structure is of the India weir type and is the first of the kind ever attempted in this country. It will have a length of 4,780 feet across stream and will be 19 feet high and up and down stream will have a length of 247 feet. It will be a great mass of masonry resting on the sandy bottom of the river, as no bed-rock was found in the channel at this point. The weight of this structure will be 600,000 tons. Water will be diverted by means of canals connecting with both ends of the dam and the area irrigated will be approximately 90,000 acres. When irrigated this will probably be the most productive region on this continent. Harvests are practically continuous throughout the year, and the yields from well-irrigated lands are enormous.

1267 MILES OF CANALS ALREADY CONSTRUCTED

A summation of the work of the Reclamation Service to January 1, 1907, shows that it has dug 1,267 miles of canals, or nearly the distance from Washington to Omaha. Some of these canals carry whole rivers, like the Truckee River, in Nevada, and the North Platte, in Wyoming. The tunnels excavated are 47 in number, and have an aggregate length of 9½ miles. The Service has erected 94 large structures, including two great dams in Nevada and the Minidoka dam in Idaho, 80 feet high and 650 feet long. It has completed 670 headworks, flumes, etc. It has built 376 miles of wagon road in mountainous country and into heretofore inaccessible regions. It has erected and in operation 727 miles of telephones. Its own cement mill has manufactured 70,000 barrels of cement, and the purchased amount is 312,000 barrels. Its own sawmills have cut 3,036,000 feet, board measure, of lumber, and 6,540,000 feet have been purchased. The surveying parties of the Service have

Cornfield Near Granger, Under Sunnyside Canal, Yakima County, Washington

completed topographic surveys covering 10,970 square miles, an area greater than the combined areas of Massachusetts and Rhode Island. The transit lines had a length of 18,900 linear miles, while the level lines run amount to 24,218 miles, or nearly sufficient to go around the earth.

The diamond drillings for dam sites and canals amount to 47,515 feet, or more than 9 miles. Today the Service owns and has at work 1,154 horses and mules. It operates 9 locomotives, 223 cars, and 23 miles of railroad, 39 stationary engines, and 27 steam engines. It has constructed and is operating 5 electric light plants. This work has been carried on with the following force: Classified service, 380, including Washington office; laborers employed directly by the government, 3,500; laborers employed by contractors, 6,100, or a total of all forces of 10,000. The expenditures now total about $1,000,000 per month. The excavations of earth and rock amount to 33,000,000 cubic yards, or about one-fourth the estimated yardage of the Panama Canal. As a result of the operations of the Reclamation Service, eight new towns have been established, 100 miles of branch railroads have been constructed, and 10,000 people have taken up their residence in the desert.

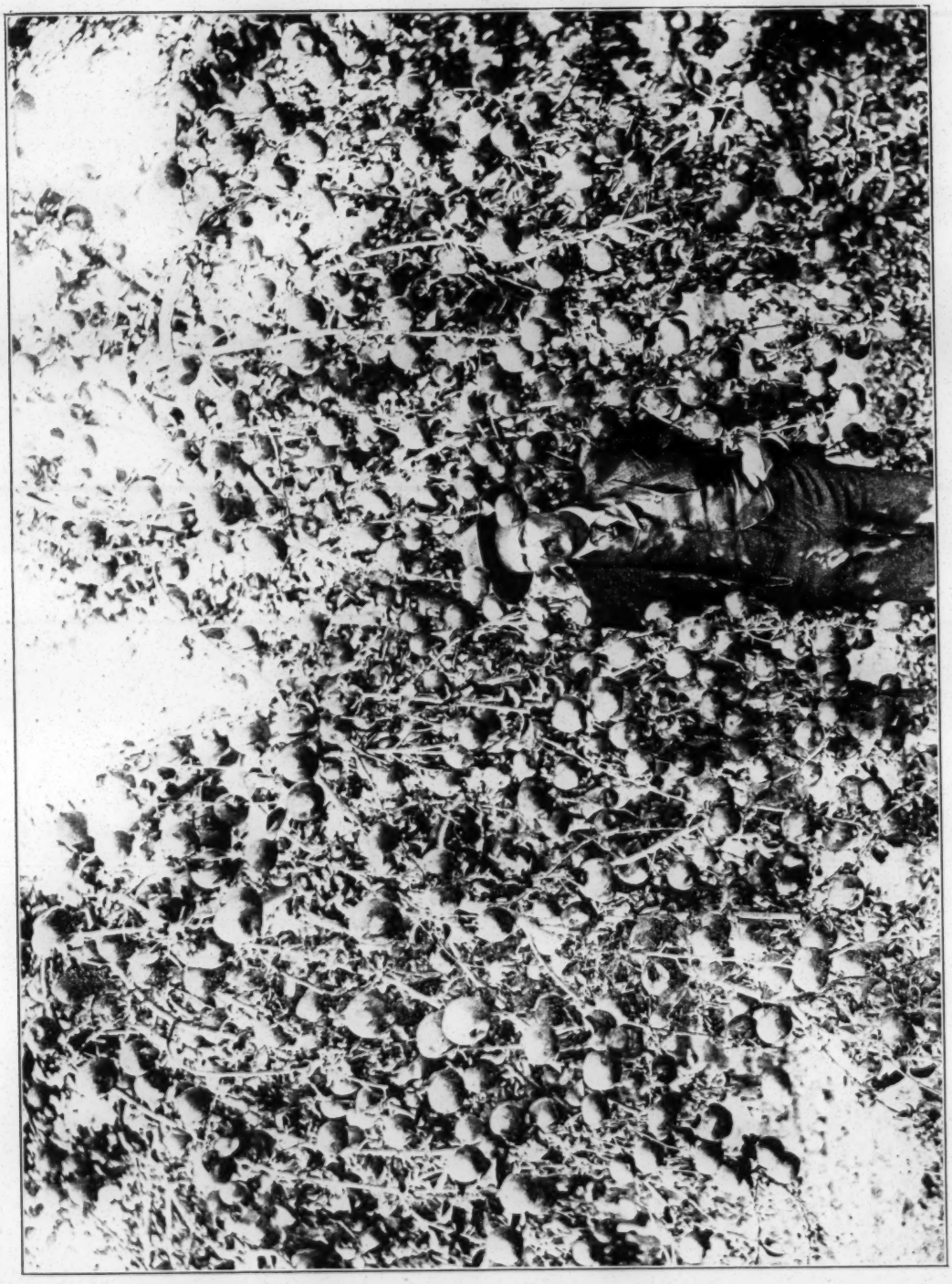
POTENTIALITIES OF THE DESERT

You cannot fix the possibilities of this land of silence and sunshine. Here the harvests are always assured. Here the farmer can estimate by a mathematical calculation the rewards for his labors.

Picking Hops Under the Sunnyside Canal, in the Yakima Valley (see page 230)

The influence of its extended horizon and its true perspective may be potential in character molding and building. Instead of the dead level of mediocrity which prevails where people are overcrowded and underfed, the desert offers the uplift of unmeasured distances, the perpetual sunshine and the individual home of contentment and prosperity. May not these develop new systems of

A Peach Tree on the Fruit and Alfalfa Farm of J. B. Ramerman, near Zellah, Yakima Valley



Apple Tree in the Orchard of Warren L. Gale in the Yakima Valley

A Rick of Apples on the Farm of F. Walsen, Yakima Valley

From a 40-acre orchard the year this picture was taken, 21,000 boxes of choice apples, or 50 car loads of 20,000 pounds each, were obtained. The apples sold at $1.00 per box f. o. b. cars. There are about 600 bushels shown in the rick

ethics and morals, leading us back from the material to the spiritual into ways of gentleness and simple living?

In this empire now asleep, awaiting the coming of the builder, perhaps the dreams of Plato and Socrates, who imbibed their splendid imagery, their stately rhetoric, and their sublime metaphor from the desert, may be revived.

Projects under Consideration and Waiting for Funds to Become Available

Projects.	Estimated acreage.	Probable cost.
Little Colorado, Arizona	80,000	$4,000,000
Sacramento Valley, Cal.	500.000	20,000,000
San Joaquin Valley, Cal.	200,000	6,000,000
Colorado River, Colorado, Utah, California, Arizona	750,000	40,000,000
Dubois, Idaho	100,000	4,000,000
Lake Basin, Montana	300.000	12,000,000
Las Vegas, New Mexico	35,000	1,500,000
Urton Lake, New Mexico	35,000	2,000,000
Walker and Humboldt Rivers, Nevada	500,000	15,000,000
Red River, Oklahoma	100 000	4,000,000
John Day River, Oregon	200,000	10,000,000
Weber, Utah	100,000	5,000,000
Priest Rapids, Washington	50,000	2,000,000
Goshen Hole, Wyoming	120,000	4,000,000
Total	3,270,000	$129,500,000

Reclamation Projects Now in Process of Construction

Project.	Estimated cost.	Irrigable acreage.
Salt River, Arizona	$5,300,000	200,000
Yuma, California-Arizona	3,500,000	100,000
Uncompahgre, Colorado	5,200,000	150,000
Minidoka, Idaho	1,800,000	80,000
Payette-Boise, Idaho	1,605,000	120,000
Garden City, Kansas	260.000	8,000
Milk River, Montana	1,500,000	40,000
Huntley, Montana	900,000	33,000
Sun River, Montana	500,000	16,000
North Platte, Nebraska-Wyoming	4 100,000	110,000
Truckee-Carson, Nevada	4,000,000	200,000
Hondo, New Mexico	336,000	10,000
Carlsbad, New Mexico	600,000	20,000
Rio Grande, New Mexico	200,000	15,000
Lower Yellowstone, Montana-North Dakota	2,700,000	60,000
Buford-Trenton, Williston, Nesson, North Dakota	1,270,000	40,000
Klamath, Oregon-California	2,400,000	50,000
Umatilla, Oregon	1,100,000	18,000
Belle Fourche, South Dakota	3.000,000	100,000
Strawberry Valley, Utah	1,850,000	35,000
Okanogan, Washington	500,000	9,000
Tieton, Washington	1,400,000	24,000
Sunnyside, Washington	2,000,000	40,000
Wapato, Washington	600,000	20,000
Shoshone, Wyoming	3,500,000	100,000
Total	$50 121,000	1,598,000

SALTON SEA AND THE RAINFALL OF THE SOUTHWEST*

By Alfred J. Henry

Professor of Meteorology, U. S. Weather Bureau

On February 11, 1907, the break in the Colorado River, which was described by Mr Arthur P. Davis, Assistant Director U. S. Reclamation Service, in the January number of the National Geographic Magazine, was definitely closed for the second time. A lake 440 square miles in area and 80 feet deep has been left.

THERE is a growing belief in the extreme Southwest, and possibly in other parts of the country, that the creation of Salton Sea is, in large part, responsible for the heavy rains of the last two years, not only in Arizona, but also in the Rocky Mountain states, and thence eastward over the plains. So strong is this belief that some persons have gone so far as to publicly advocate the maintenance of the present Salton Sea, notwithstanding the efforts now being put forth to shut off its supply.

Like other popular fallacies, the present one doubtless arose from a careless consideration of the facts in the case, failure to consider whether the supposed cause was capable of producing the observed result, and finally, a misconception of the physical laws under which moisture in the atmosphere is condensed and precipitated as rain.

The facts, so far as they concern the purpose of this article, omitting all general details which are already familiar to the public, are as follows:

As early as October, 1904, there was some seepage water in the depression now known as Salton Sea, but no overflow water. In November, 1904, the Development Company completed a third intake on the Colorado River some miles below the first and second intakes in order to increase the supply of water for irrigation purposes. Soon thereafter a flood wave in the Colorado River scoured out the third intake so that it admitted more water than was needed. The surplus, which at times was very large, naturally sought the lowest part of the depression known as Salton Sink, and in the course of time Salton Sea was formed. It appears, however, that the increase in size of the so-called Salton Sea was gradual, and that it was not until October, 1905, that the total flow of the Colorado River was carried by various channels, mainly the Alamo and New rivers, into Salton Sink.

The rainfall of October, November, and December, 1904, in southern California and Arizona was not out of the ordinary, but beginning in January, 1905, and continuing throughout February, March, and April, an extraordinary amount of rain fell over a belt of country stretching from Florida to southern California, and the region of heavy rainfall also extended into eastern Colorado, eastern Wyoming, western South Dakota, western Nebraska, and western Kansas. With the coming of summer the locus of heavy rains shifted to the states of Nebraska, Kansas, South Dakota, and Oklahoma and Indian territories. September and October were generally dry months, but in November heavy rains fell in Texas, and thence westward to Arizona. December was dry. In 1906 practically the whole of that great region west of the ninety-fifth meridian received more than the normal rainfall, the regions of greatest excess being central and western Kansas, central and western Nebraska, all of South Dakota, Wyoming, Colorado, Utah, and central and southern Califor-

* From The Monthly Weather Review.

nia. The excess in Arizona and New Mexico was not strikingly large.

Considering these facts in proper sequence, it will be observed, first, that Salton Sea was not formed until *after the heavy rains of January, February, and March, 1905,* so that to ascribe the increased rainfall to Salton Sea would be to place the effect before the cause.

Admitting, for the sake of argument, that a body of water of the dimensions of the present Salton Sea existed before January, 1905, let us examine its probable effect on the rainfall of the Southwest. Its present dimensions are approximately 60 miles long, 8 miles broad, and say 25 feet deep on the average. These are rough estimates, but they will serve the purpose. The cubic contents would therefore be $60 \times 8 \times 0.0047 = 2.2$ cubic miles of water.

The normal annual rainfall of Arizona as determined by Section Director Jesunofsky is 11.75 inches. The rainfall for several years previous to 1905 was as follows:

1899	8.4 inches.
1900	8.3 inches.
1901	10.6 inches.
1902	10.3 inches.
1903	9.9 inches.
1904	9.8 inches.
1905	26.6 inches.

From this statement it will be seen that the excess for 1905 was 14.85 inches, an amount more than equal to the normal annual rainfall. An inch of rainfall per square mile is equal to 72,516 short tons. As the area of the territory is 113,956 square miles, the excess in tons for 1905 would be in round numbers $72{,}516 \times 14.85 \times 113{,}956 = 122{,}717{,}500{,}000$ short tons. Converting this amount into cubic miles of water for a comparison of its volume with that of Salton Sea, we have, as before, 1 inch of rainfall on a square mile weighs 72,516 tons. A cubic mile would be this weight $\times 5280 \times 12 = 4{,}594{,}613{,}760$ tons, or, assuming that the temperature was somewhat above 39° F., say in round numbers 4,500,000,000 tons. The number of cubic miles of rain that fell in Arizona in excess of the average was, therefore, $\frac{122{,}717}{4500} = 27$. This quantity, as may be readily seen, is twelve times greater than the total volume of the Salton Sea. In other words, the total volume of the latter would barely suffice to produce one-twelfth of the surplus rain that fell in Arizona, to say nothing of the rainfall in adjoining regions. The total amount of water now in Salton Sea, if uniformly distributed in Arizona, would cover the Territory to the depth of about an inch and a quarter, or the equivalent of one good soaking rain. How then could the evaporation from Salton Sea, even if it amounted to 8 feet per annum, granting that it was all condensed and precipitated to earth, produce the enormous quantity of water that fell in Arizona in 1905?

As pointed out by Mr Arthur P. Davis in the NATIONAL GEOGRAPHIC MAGAZINE, January, 1907, the advocates of the idea that Salton Sea has caused an increase in the rainfall of the Southwest seem to have ignored the presence of the Gulf of California, a body of water hundreds of times larger than Salton Sea, and distant from Arizona about the same number of miles. This body of water washes the shores of a region probably as arid as can be found on this continent. It has done so for centuries, yet no progressive changes from arid to humid conditions have been observed.

Mr Davis has also pointed out that the disaster which caused the formation of Salton Sea has prevented the normal overflow of the lands in the Colorado Valley below Yuma. The areas of land in that region which would have been overflowed under normal conditions are nearer to Arizona and New Mexico, and of greater extent than Salton Sea, so that if evaporation alone causes rainfall, the tendency of the formation of Salton Sea would have been to reduce rather than increase the rainfall of Arizona and New Mexico.

The obvious deduction from the foregoing is that the Salton Sea is not responsible for the phenomenal rainfall of 1905 in Arizona.

THE INFLUENCE OF SMALL BODIES OF WATER ON LOCAL CLIMATE

It is generally believed that small bodies of water have an appreciable influence on the local climate of contiguous land areas, but it is exceedingly difficult to distinguish between results which may be due to purely local causes and those which may be reasonably due to general causes.

The effect of a small body of water such as the Salton Sea on the climate of the surrounding territory may be recognized in two principal ways, first, in its equalizing effect on the temperature, and second, in the increased amount of water vapor thrown into the air by evaporation, since more water is evaporated from a water surface than from forests or fields. Owing to the fact that a water surface warms up much more slowly than a land surface and retains its heat much longer, the water surface will, in general, be warmer at night than the land and cooler in the daytime. Thus there will be a tendency toward lower maximum temperatures and higher minimum temperatures in a narrow zone immediately surrounding the lake, but especially on the leeward shore.

The distinguishing characteristics of the climate of the Salton Sea region are those of the desert, viz, great heat and dryness. The annual mean temperature is about 77°; winter, 57°; spring, 75°; summer, 97°, and autumn, 79° F. The maximum temperatures of the summer months range from 115° to 130° F., and the minimum temperatures of winter from 20° to 25° F. The annual precipitation is about 2.50 inches, most of which occurs in the cold months. The months of April, May, and June are practically rainless, but occasional showers fall in July, August, and September in about 30 per cent of the years. December and February are the months of greatest rain. In the winter snow may fall, but it rarely lies on the ground more than twenty-four hours; the average number of days in a year with 0.01 inch or more of precipitation is four. The winds of the Colorado Desert are mostly northwesterly in winter and southeasterly to easterly in summer. In the cold season they flow through San Gorgonio Pass, in the northwestern part of Riverside County, elevation about 2,500 feet, as westerly winds, but are deflected somewhat toward the southeast by the San Bernardino Range, which skirts the eastern and northern limits of the desert. Being descending winds and dry, they are not favorable to precipitation. The cold winds are generally from north and east, while rain winds are from east and south. In summer the winds are less stable as regards direction than in winter. While they are largely from the east and south, there is at times a marked westerly component. No record of the diurnal change in the wind for the Salton Sea region is available.

Since brisk winds promote evaporation by constantly renewing the air over the evaporating surface, it becomes important to know something of the force of the wind in the vicinity of Salton Sea. Unfortunately no instrumental records of wind velocity are available for that region, but possibly we may learn something of interest by consulting the records maintained at Yuma, Arizona. At that place high winds are infrequent, yet there is considerable motion in the air during the afternoon and evening hours. Such motion, however, is clearly discontinuous and not calculated to transport air bodily out of the desert region, or to cause the importation of air of different density and moisture from adjoining regions. The particles of air that are set in motion by the winds of the daytime do not move continuously in the original direction, but are carried hither and thither by the light variable airs of the night-time, and in some cases even in a direction contrary to that in which they traveled in the daytime. The

annual hourly velocity of the wind at Yuma is nearly seven miles per hour, 3.1 meters per second, and the range is from an average velocity of three or four miles in the early morning hours to eight or ten miles in the afternoon. At Furnace Creek, in Death Valley, an independent north-south basin, an average wind velocity of 9.9 miles per hour, 4.5 meters per second, was recorded from May to September, inclusive, but here the force of the wind is doubtless augmented by the local topography, and the results are not of general application. In general, it seems reasonable to assume that while there is more or less interchange of air between different portions of the desert, there is no permanent flow of the surface air in any direction except in winter, when the Plateau region is occupied by an area of high pressure. Then the winds blow from the north with much steadiness, so long as the Plateau high exists.

THE VAPOR CONTENTS OF THE AIR

The moisture contents of the winds, especially at Yuma, are surprisingly constant. The north wind, since it descends from somewhat higher levels, is, in general, a dry wind, yet in the winter season the greatest relative humidity of the month may be experienced with a north wind. The moisture contents of the different winds for a winter month (February) and a summer month (August) are shown in the following table:

Vapor Tension at Yuma, Arizona.

(An average of ten years.)

Direction.	February.	August.
	Inches.	*Inches.*
North	0.16	0.57
Northeast	0.20	0.59
East	0.20	0.67
Southeast	0.25	0.67
South	0.21	0.60
Southwest	0.22	0.55
West	0.21	0.56
Northwest	0.20	0.54

The amount of aqueous vapor actually present in the air may be expressed either by the expansive force or pressure that it exerts or by its weight in grains in a cubic foot of space. In the above example it is stated in terms of its expansive force, or barometric pressure, in inches of mercury. Whether expressed in terms of weight or pressure, the amount of vapor actually present is sometimes called the absolute humidity. It is very important to distinguish between the absolute humidity and the relative humidity, sometimes referred to merely as the humidity. The relative humidity is the ratio of the amount of vapor actually present to that which might be present at the existing temperature if fully saturated: Example from Death Valley, June, 1891, temperature of dry bulb, 108° F., wet bulb, 68° F., whence is obtained from hygrometric tables: dew-point, 39° F., relative humidity, 10 per cent. The observation quoted means, first, that in order to condense any of the moisture present into dew or rain the temperature would have to fall 69° (from 108° to 39° F.), or the amount of moisture then in the air would have to be increased tenfold. This point cannot be emphasized too strongly. At the temperatures which exist in the Colorado Desert, and under the general conditions of aridity which prevail, the atmosphere takes up vapor as a sponge absorbs water. It should be remembered, moreover, that the capacity of the air for vapor is vastly greater at high than at low temperatures; the problem in the Southwest, therefore, so far as the production of rain is concerned, is not essentially one of increasing the vapor contents of the air, but rather of diminishing the temperature to the point at which condensation takes place. There is sufficient moisture in the air to produce abundant precipitation if means of cooling it were at hand. The absolute humidity at Yuma is slightly greater than that of St. Louis, and only a little less than that of Vicksburg, both of which points have, in general, an abundance of rain and a so-called moist atmosphere.

The amount of vapor taken into the air over Salton Sea must be considerable in the course of a year, but to adduce definite and satisfactory proof that it has increased the rainfall is a very difficult problem. That it has increased the relative humidity in a slight measure is undoubtedly true. Aqueous vapor in the absence of a strong wind circulation is diffused very slowly throughout the atmosphere. It is, therefore, improbable that any considerable portion of the local supply of vapor ever passes beyond the immediate confines of the desert. The writer knows of but one case where there is a reasonable presumption that the local evaporation has increased the rainfall, and the increase in this case amounts to but two or three inches annually over the area whence the evaporation proceeds.

WOMEN AND CHILDREN OF THE EAST

The Little Black Brother

A Tamil child in everyday costume of silver and gold. The after-dinner pose

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THE following illustrations were made and collected by Eliza R. Scidmore, Foreign Secretary of the National Geographic Society; author of "Jinrikisha Days in Japan," "Java, the Garden of the East," "Winter India," "China, the Long-lived Empire," etc., etc., and are here given to show something of the personal side of the people of the East.

The Far East is a constant source of wonder and fascination to westerners. The marvelous architectural triumphs of India, Burma, and Siam, displayed in gorgeous temples and enormous rock-hewn edifices, and the delicate artistic skill of Japanese carvings, pottery, and tapestries excite our admiration and respect; but after all it is the men, women, and children of these countries who appeal to the traveler most strongly. Miss Scidmore has passed many years in the East, and the special facilities which have been given her on account of her sympathetic appreciation of the best in oriental character have enabled her to obtain unusual photographic impressions of the people.

A knowledge of the people of other lands is as essential to the success of a nation nowadays as the understanding of human nature is essential to the success of an individual. It is believed that this series have much educative value and are worthy of considerable study.

Cingalese Children

The little children have no need of other clothing than a few necklaces in their greenhouse home of Ceylon. As an extra decoration the little black brother has usually two vaccination marks on his arm

Mother and Child—Ceylon

The Dutch or the Portuguese gave the Cingalese women the decolletee jacket they wear in combination with the native sarong. Silver or coral beads show with telling effect on their very black necks, and the little black babies ride astride of the mother's hip with easy grace

Tamil Woman in Ceylon

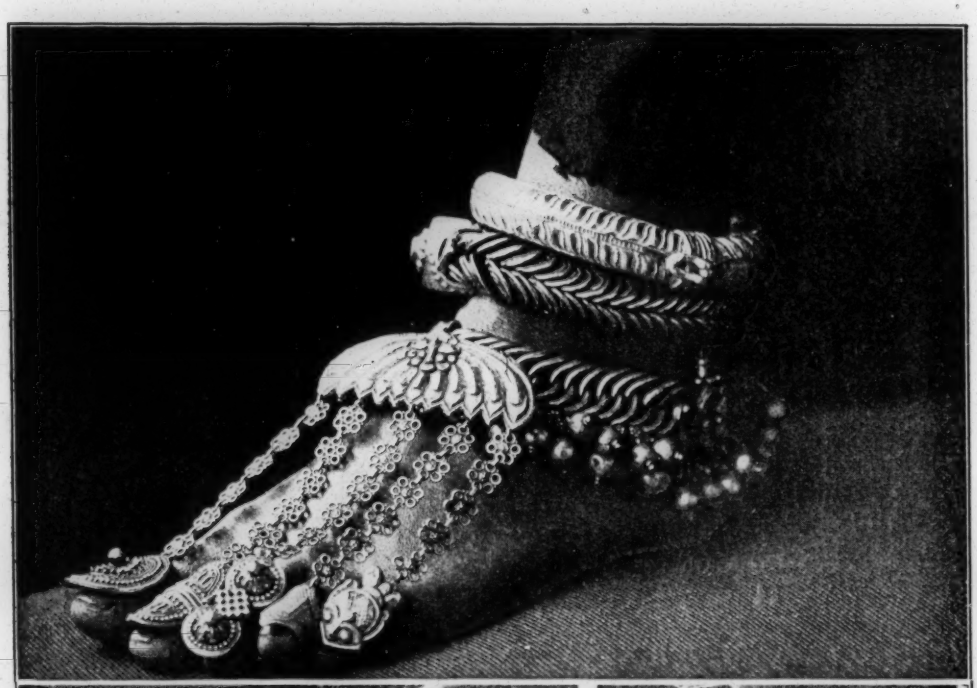
With a red pottery jar on her head, a white sari with broad red border and a few silver bracelets, the Tamil woman is as graceful a figure as ever seen in Greek friezes, and if she only stops to gossip with a figure from another frieze, seems delicately posing for some one to sketch or photograph her with a cacao tree for background

Cingalese Children

The older sister is as much a little mother in the tropics as elsewhere, and the cool drinkis always in demand by thirsty man, whatever his size may be

Little Tamil Girl

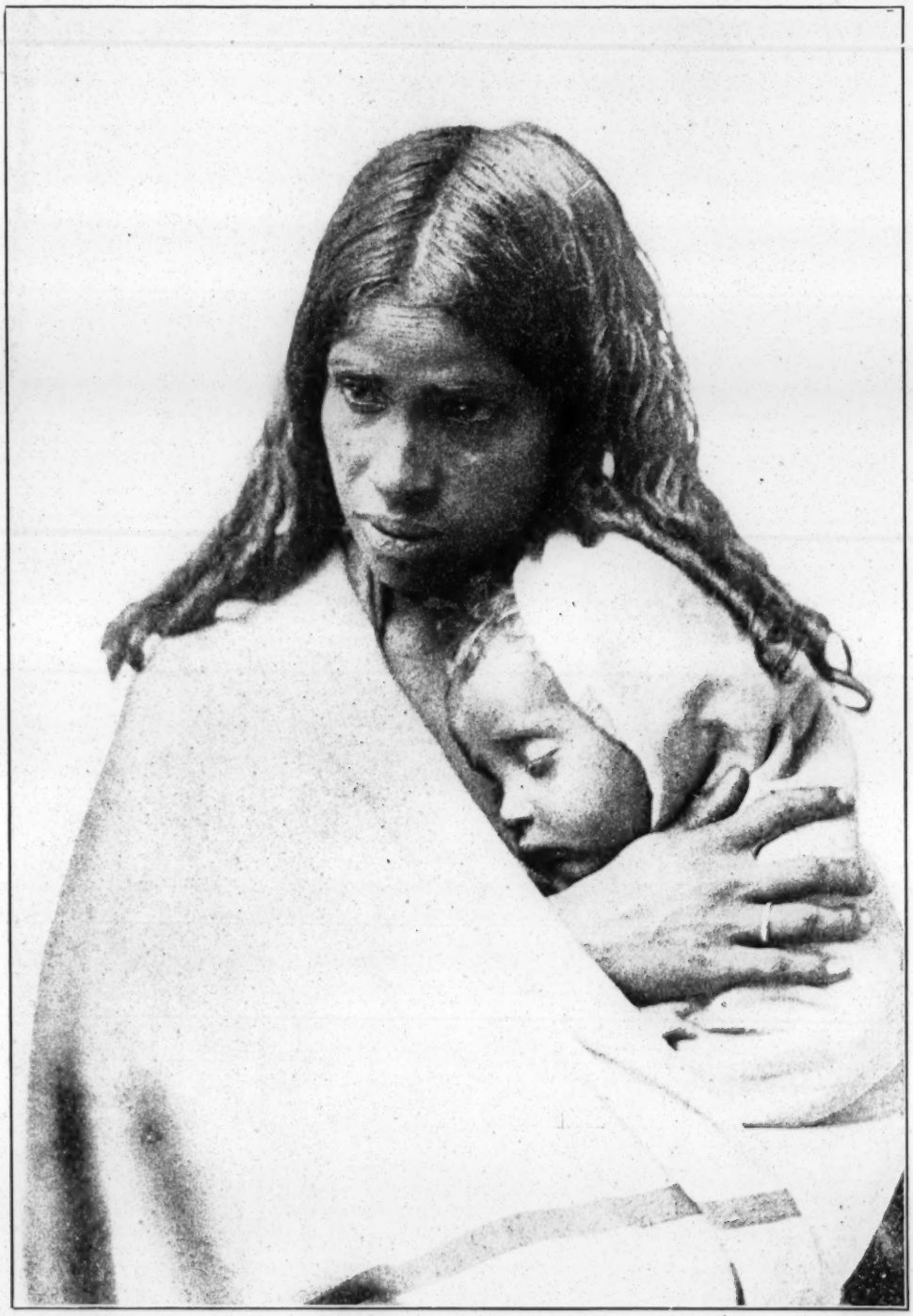
Instead of the savings bank or the buried pot, the Hindu puts his wealth into jewels and gold coin, and ornaments his women with tangible riches, where they are always under his eye and can be counted. For weddings, the jewels are often hired by both families, and children of the slums wear eight and ten necklaces, the bracelets and jewels of a temple idol for one day only



Tamil Girl's Foot and Ankle

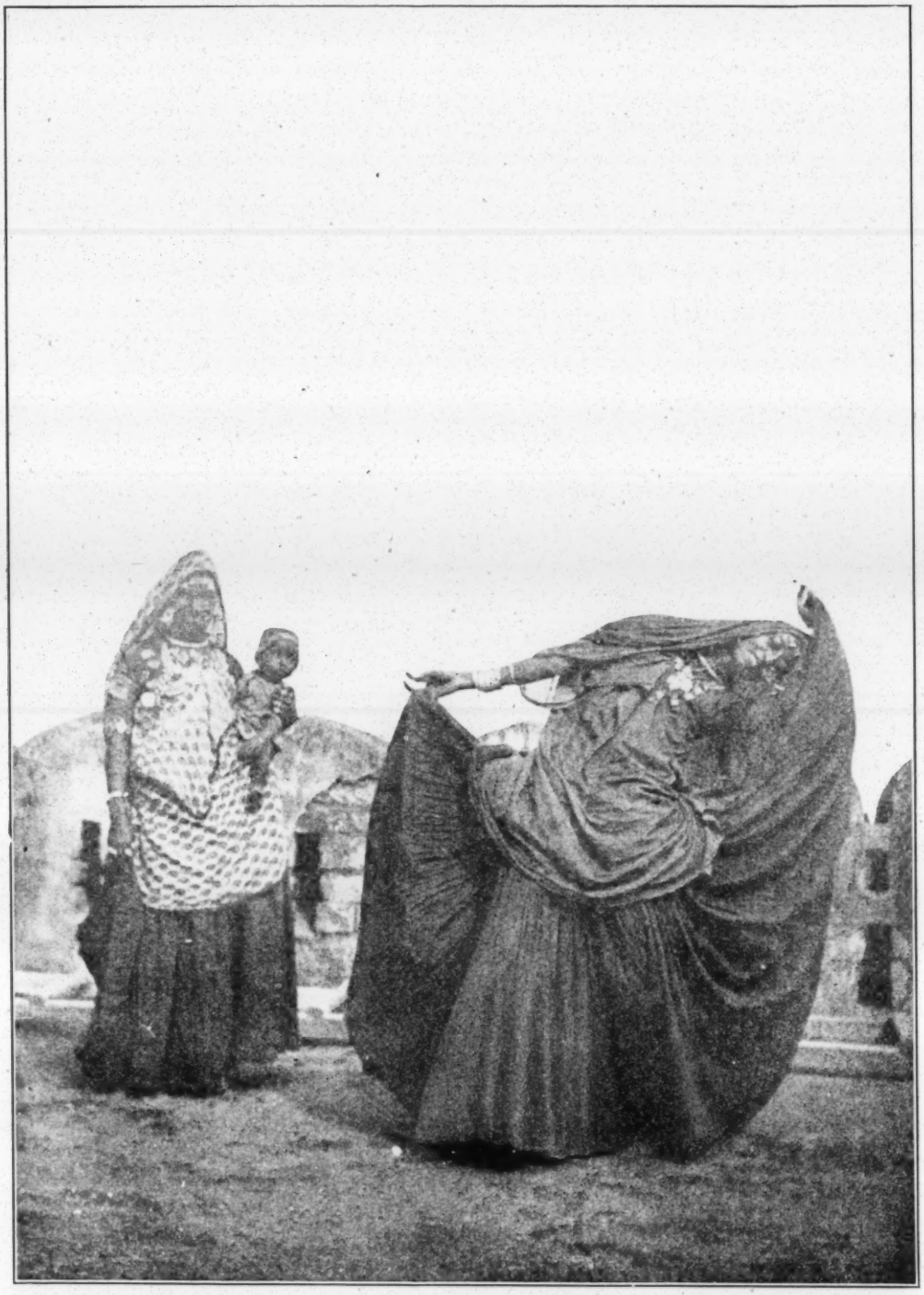
With bells on her ankles and rings on her toes, the dancing girl does not need cast and accompaniments to her dreary measures

Buying the Goldfish—Japan



Toda Mother and Child

The Todas are a wild hill people of southern India, occupying the Nilgiri Hill region near Madras, where the famous resort of "Ooty," or Ootacamund, is situated, 7,000 feet above the sea



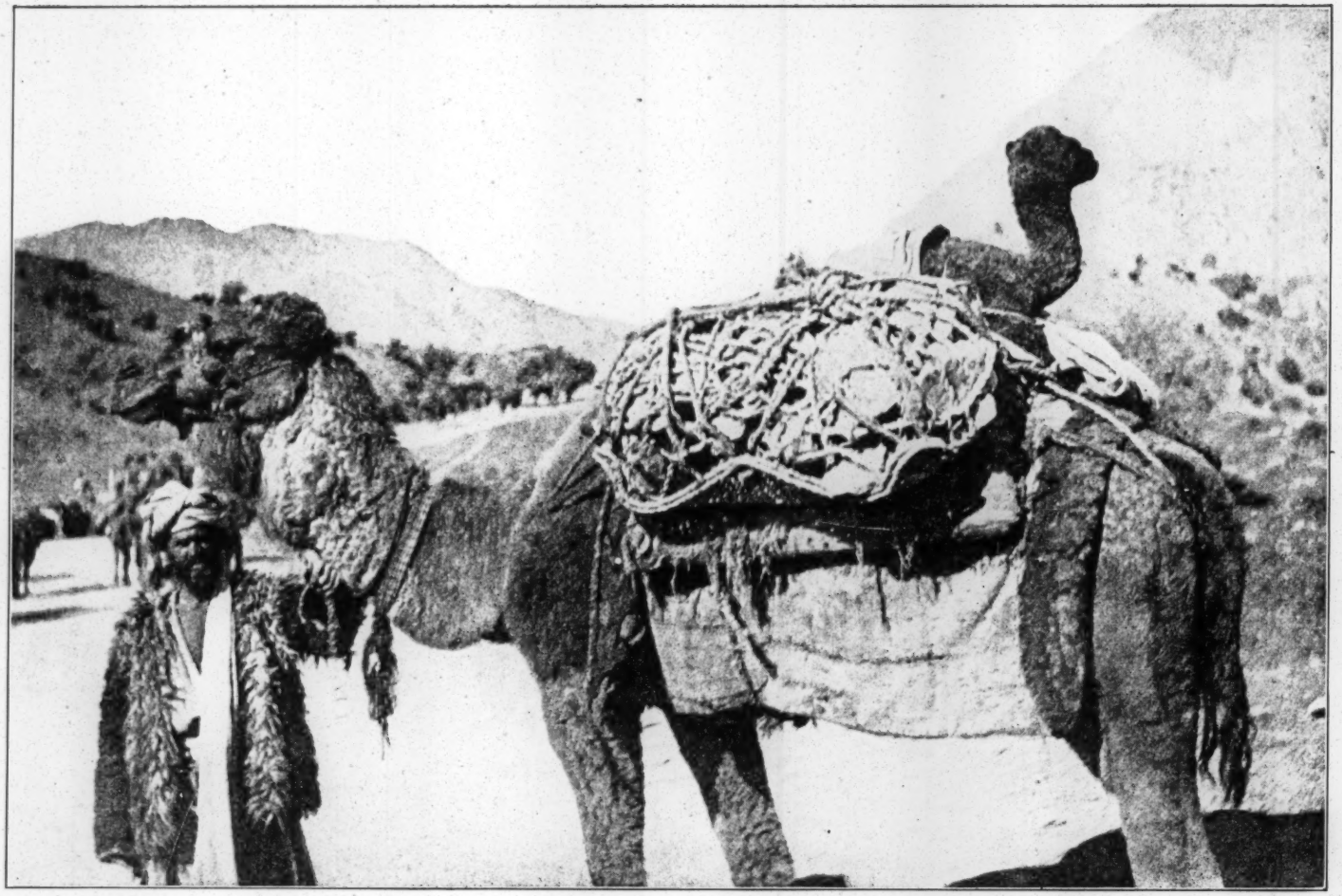
Street Dancers—Delhi

The dancing women, who go about Indian streets carelessly veiled, and who come to the portico of the hotels to dance for a few coppers, are often more picturesque and attractive than the jeweled dancers at palace entertainments. These two Delhi dancers wore only coarse yellow and red cotton clothes, their jewels were necklaces and bracelets of silver rupees and ornaments of cheap imitation of rubies, pearls, and emeralds, but as color studies they were admirable. They did a skirt dance, ages old in India, without the aid of colored lights or glass floor

Street Dancers of Delhi

Bridegroom's Palki in Wedding Procession at Jeypore

The ten-year old bridegroom, in cloth of gold turban, coat covered with jewels, rides in a palki, suspended from a silver arch or yoke, hung with red velvet and silver tassels. The body of the car is all tinsel and silver and velvet, and carried by coolies of the shabbiest clothing. All the family, in all the finery they own or can hire, attend the parade through the streets, and singing and dancing girls give performances whenever the procession halts

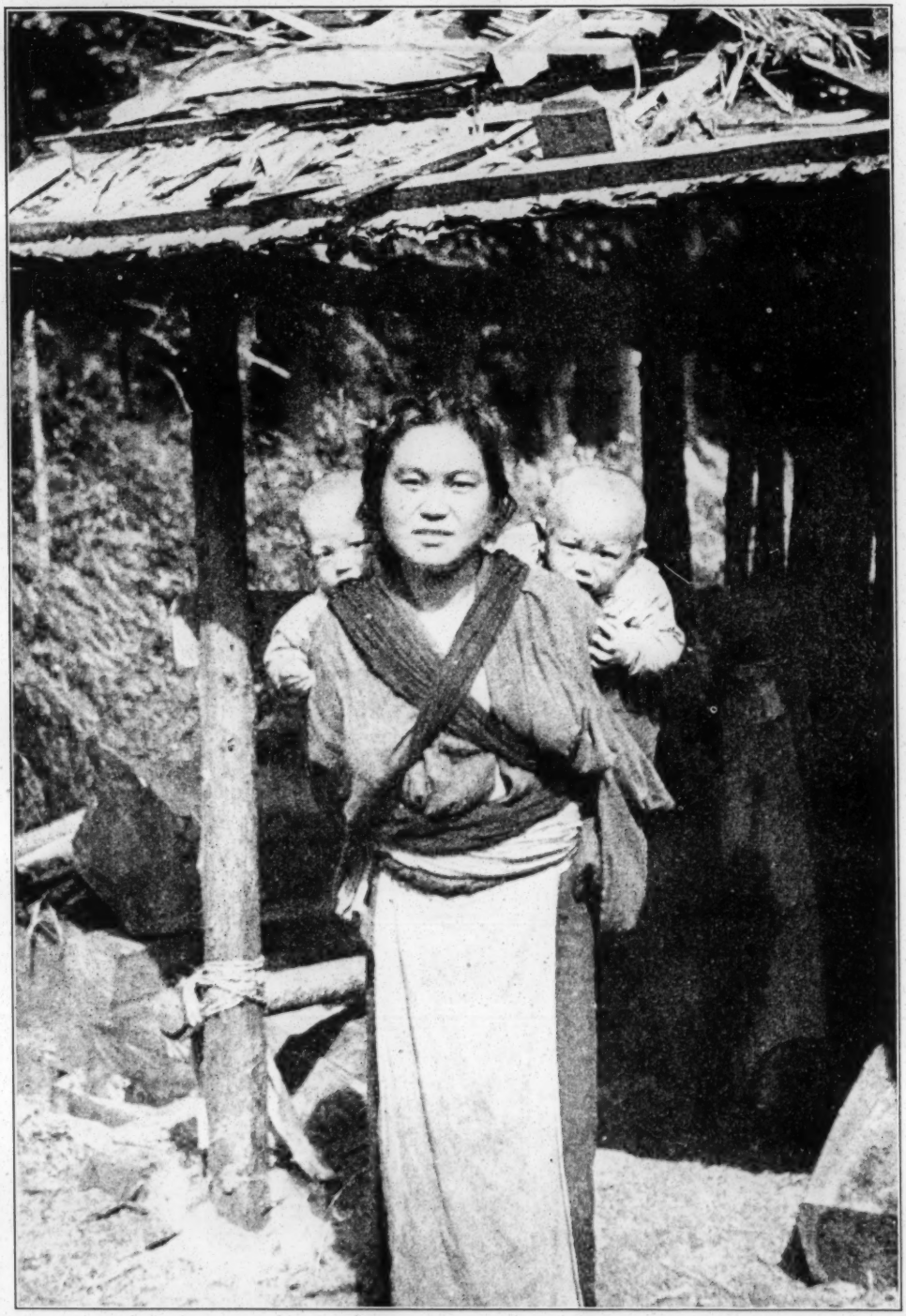


Camels in the Khyber Pass

Caravans of two and three hundred camels in line go up and down the Khyber Pass all of the two days in the week that the famous defile is open to general travel, and guarded by troops. The camels bring down silk, dried fruits, grapes, and spices from Cabul, and take back all sorts of European goods and Indian products from Peshawur's bazars. The strangest thing we saw was a baby camel with the long neck and goggle eyes of a young ostrich, securely tied in the saddle-bags on its mother's back as it journeyed toward Afghanistan

The Cry of the Famished, Gwalior

A Gwalior Madonna



The Twin Babies of Nikko—Future Soldiers of the Empire

Nothing so diverts the newcomer in Japan as the babies on the backs of mothers and older children. If one baby riding pig-a-back is quaint and funny, twin babies are more than twice as droll.

The Twin Babies of Nikko

The twins were a sturdy little pair, and even when they were a year old, their mountain mother thought nothing of tying them on her back and walking two miles

For the Emperor's Soldiers in Manchuria

Immediately upon the opening of the war, all the women of Japan set themselves to preparing comforts for the soldiers at the front. Even school children knit stockings, mittens and bands, and one often saw these accomplished people holding the skein of yarn with their feet, as in this picture, while they wound the ball with their hands

Old Age in the Sunshine

The wrinkled old woman has carried her mat and her sewing-stand out from the house and sits by the roadside to do her mending

A Group of Buddhist Nuns—Japan

The Buddhist nuns wear white garments and shave the whole head. They perform mass, care for the altar, and do all the temple offices of priests. They may go about freely, and are often met at places of pilgrimage

The Lady Abbess of Hokkeji Convent, Nara

Feeding the Storks, Okayama Castle Garden

Javanese Mother and Child

The Javanese baby rides astride of its mother's hip, like the Hindu baby, but its weight is supported by the *slandang*, a scarf of *battek*, or painted muslin. It lies comfortably in this cotton cradle able to sleep and relax without any attention from the mother, who has both hands free for work

From "Java, the Garden of the East," by Eliza R. Scidmore. Copyrighted by the Century Co.

Painting Sarongs in Java

The *sarong*, or Javanese petticoat, is a straight piece of *battek*, or painted cambric, one yard deep and three yards long, sometimes sewn up and left like a bag, with both ends open. It is drawn smoothly over the hips and the fullness gathered in a knot, that by a deft twist is made self-fastening. English cambric is the material used, and the patterns, in a rich dark red, brown, and blue, are applied from a tiny funnel with a needle-sized opening that distributes the hot dye in hair lines, if needed. Geometrical design and natural forms, highly conventionalized, are the motifs of the unique ornament

King and Queen of Burma

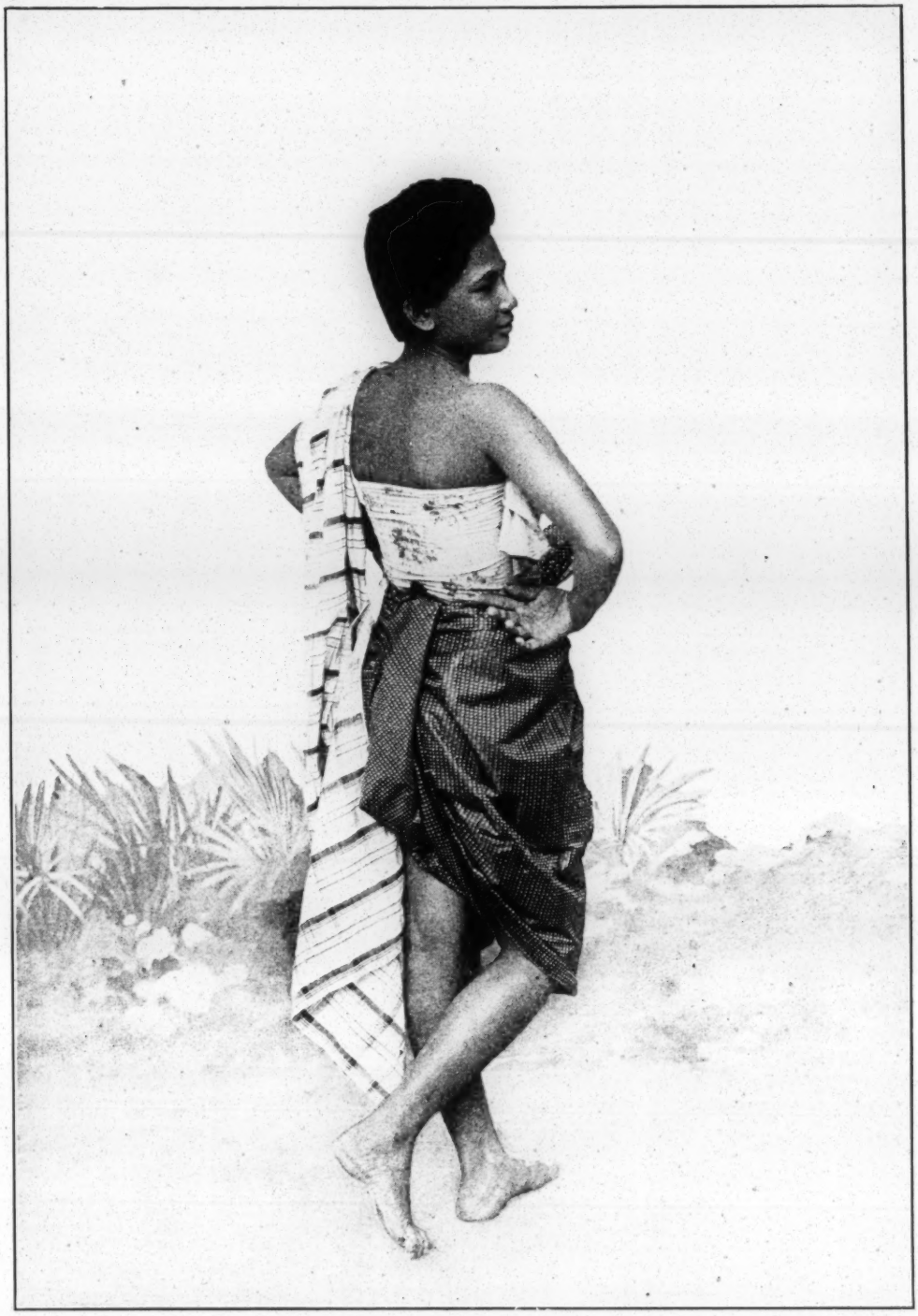
King Thebaw of Burma and his blood-thirsty Queen Soupayalat, who brought about his downfall in 1885 and the annexation of Burma by England. The royal pair are framed in one of the wonderfully carved teak entrances to the Shive Dagon Pagoda at Rangoon

Manchu Lady and Her Son

The long Manchu gown reaching to the feet and the short overjacket make that costume the most dignified and becoming of any in China. The broad hairpin, wound with strands of satin-smooth black hair and finished with great bunches of flowers, is a most becoming headdress, and when covered with jewels and hung with twelve inch tassels of pearls, as for the imperial princesses, the result is more splendid than that of any tiara, coronet, or crown

Siamese Prince in Full Regalia of Jewels

There is no age limit to the wearing of jewels in the gorgeous East, and baby princes, clad in a mail of gold brocade crested over with pearls and colored stones and glittering with pin points of diamonds from cap to toe, are fit occupants of jeweled thrones



Siamese Woman in National Dress

The people of Siam cling to their native dress, and prince and peasant, men and women alike wear the *panung*, which is the Malay *sarong* drawn up between the knees and tucked in the belt until it looks like a pair of very full knickerbockers. Princes wear military jackets and long silk stockings with the *panung*. Ladies of high degree wear Parisian blouses with the *panung*, while the women of the people adopt the loose Chinese jacket or retain the native scarf over the shoulder like this figure

NOTES ON CENTRAL AMERICA*

THE area of Central America is a little larger than that of California, with a population of about 4,300,000. Though it lies wholly within the tropics, it is only the belts adjoining the oceans which have torrid climates. The high lands of the interior, five and six thousand feet above the sea, could have been no more effectively situated in a temperate zone.

The general superficial appearance of Central America may be said to be—save on the Caribbean Sea coasts, where it is low and level—that of a region of forest-clad hills, fertile valleys, large lakes, and small rivers. All the capitals are in the interior, and are situated generally at an altitude of from three to five thousand feet, where the climate is cool and salubrious; the seaports connecting with the capitals are small, hot, and unhealthy.

A chain of active volcanoes extends through Guatemala, Salvador, and Nicaragua, several of which, notably Santa Maria, in Guatemala, have had violent eruptions during recent years. This section is also frequently visited with destructive earthquakes.

Within a few months Central American travelers will be able to go from New York to Guatemala City by rail, as the few railway gaps in Guatemala and Mexico are being rapidly filled.

A Comparison of the Central American Republics

Republics.	Population.*	Area in square miles.	Annual commerce in gold dollars.	Miles of railways.
Guatemala	1,842,134	48,290	$12,600,000	500
Salvador	1,006,848	7,225	14,000,000	100
Costa Rica	331,340	18,400	12,300,000	340
Nicaragua	420,000	49,200	1,250,000	200
Honduras	744,901	46,250	4,500,000	100

* *Guatemala.*—About 60 per cent of the population are pure Indians, most of the remainder being half-caste. The foreign population numbers about 15,000.

San Salvador.—Aboriginal and mixed races form the bulk of the population, the latest census returns giving 772,200 Mestizos, and 234,648 Indians.

Nicaragua.—The bulk of the population consists of Indians, mulattoes, negroes, and mixed races.

Costa Rica.—The population is nearly all white.

Honduras.—The bulk of the population is Indian.

The capitals, with the populations, are as follows:

Guatemala City	100,000
San Salvador	60,000
San José	24,500
Managua	30,000
Tegucigalpa	35,000

NICARAGUA

The development of Nicaragua during the last decade has been most gratifying to the friends of the country. Given a remarkably rich territory of nearly 50,000 square miles and a population of a little over 400,000, the field for successful enterprise is great indeed. The prosperity of the country is mainly due to the administration of President José Santos Zelaya, who now for twelve years has been at the head of affairs in Nicaragua.

When General Zelaya first came into power there were only 90 miles of railroad line. Now the mileage is double that figure; but what counts for more is that the work now under way, when completed, will assure through communication from the Pacific to the Atlantic. The surveys for this transcontinental line have been completed, several miles of track have been laid, and much grading in addition has been done.

* For further information the following authorities are recommended:

The Hand Books on Salvador, Costa Rica, Honduras, Guatemala, and Nicaragua, published by the International Bureau of American Republics, Washington, D. C.

"The Capitals of Spanish America," by William E. Curtis. Harper and Brothers.

"In and Out of Central America," by Frank Vincent. D. Appleton & Company.

"The Report of the Inter-Continental Railway Commission," 7 volumes, published by the Commission, Washington, D. C.

"Guatemala, the Country of the Future," by C. M. Pepper, Washington, D. C.

Also the various reports of Messrs C. M. Pepper and H. G. Davis, of the Inter-Continental Railway Commission.

Outline Map of Central America

Surveys have been made for a railroad line to Matagalpa, in the center of the coffee district, where there are many Americans. From this line branches to the Rio Grande, Prinzapolka, and other districts are to be built.

For the encouragement of immigration, in addition to the railroads, the government is giving considerable attention to the improvement of the highways. This is in pursuance of the policy of opening up the interior. A recent official report shows that 1,100,000 acres of public lands have been taken up.

In President Zelaya's recent manifesto, reviewing the state of the country since 1893, an outline is given of what has been accomplished by his administrations. Political rights stand today on a broader basis; the people of all social classes share in the government. Religious tolerance is established, and *habeas corpus*, non-sectarian instruction, protection for inventors and authors, a genuine system of municipal self-government, and a wide extension of political rights are among the other advantages Nicaragua enjoys under this progressive administration.

The principal agricultural products of Nicaragua are bananas, chocolate, coffee, indigo, corn, sugar cane, rice, and tobacco. The timber possibilities are considerable. Cattle raising is becoming an important industry. The country has extensive mineral resources.

HONDURAS

In Honduras there is no farming on a large scale, and such large plantations as are now under cultivation are chiefly along the north coast and under the direction and management of foreigners. It might be assumed that Honduras, with its varied climate, its lowlands and highlands, and undulating plains in all parts of its territory, covered with rich, fertile soil, would be essentially a great agricultural region. The situation is quite

the reverse. The native rarely raises a greater crop of corn, beans, and rice than will suffice for his needs until the following crop can be garnered. It is sometimes extremely difficult to obtain bananas, oranges, potatoes, and even corn in Tegucigalpa.

Very few fields are properly plowed, and the care bestowed on the growing corn, wheat, red beans, or sugar cane amounts almost to nothing. As it is, the ground is often so extremely fertile that the mere insertion of the kernel of corn in the earth gives the desired result, without further effort. Great areas of the mountain sides near the summits are cleared by burning down the brush and trees. The seed is planted by dropping it into the hole and covering it up with the foot. The prevalence of clouds and mist high up in the mountains, and the long duration there of the sunlight warmth, together with the richness of the soil, contribute to simplify the labor of farming in Honduras. Corn is the chief article of food, the cereal being ground and used in many ways for man and beast. Two crops a year are secured, but with this advantage and the large demand from the towns there never seems enough maize by half. Maize is grown in every part of Honduras. The same may be said of sugar cane and the red bean (frijole). Tobacco and coffee are raised chiefly in the mountainous districts of the western and central departments.

Honduras is the richest of the five Central American republics with regard to mineral resources. The development of her mines can only be effected, however, by wise and economic methods and the opening of new and cheap transportation lines.

Throughout Honduras there are vast forests covering the mountains and filling the plains. Nearly all the varieties of pine flourish here, the yellow and long-leaf pitch pine predominating. Very little of this timber is being cut or sawed for building purposes, and in order to export it in commercial quantities roads and other means of transportation must first be inaugurated.

Mahogany and cedar flourish near the oceans, and form one of the principal exports. The wood of these trees is obtained through government concession rights, generally for a period of years and at stipulated prices per tree.

In the forests are to be found rubber trees, which in numerous instances have been so recklessly tapped and scarred as to destroy their usefulness entirely.

Sarsaparilla and vanilla grow in great abundance in these tropical forests, and the product is gathered only by natives, who sell it to the exporting houses at the various ports.

The pita, called in Mexico ixtile, is a variety of agave, very prolific, and yielding fibers varying in quality from the coarsest hemp to the finest flax. It is used in the manufacture of thread, cordage, hammocks, paper, etc., and, being hardy and easily cultivated, may be made an important article of export as well as of domestic use.

SALVADOR

The republic of Salvador is the only one of the five Central American republics not having a coast line on the Atlantic. It is the smallest and most densely populated of the Central American republics, having an area of only 7,255 square miles. The frontage on the Pacific is 139 miles in length. The physical aspect of Salvador is very varied, but chiefly mountainous. On its northern frontier, and near the boundary line of Honduras, stretches the great mountain chain of the Sierra Madre, or Cordilleras, many of the peaks of which rise to a height of from 7,000 to 8,000 feet above the level of the sea.

COSTA RICA

The population of Costa Rica is nearly all white, and mostly descendants of Spaniards from Galicia. The Indians are not numerous, and are completely dis-

tinct from the civilized race. The negroes and mixed breeds live almost exclusively on the coast lands.

The Costa Ricans are all well formed, robust, and healthy people, with regular features. The women are gracious, have splendid eyes and abundance of hair, and appear affable in manner. The men are intelligent, industrious, economical, honest, and peaceable, as well as polite, truthful, and generous. They respect order and property, love to work, and are proud of their wealth and of the independence of their nation.

Every Costa Rican owns property of some kind. The better class of women follow in their dress the fashions of Europe; the lower classes have gowns of muslin or calico, and wear petticoats, rebozos, and very often Panama hats. Some adorn themselves with earrings and other jewelry, and some wear shoes.

The men dress in European style. The lower class, consisting of hard-working farmers, owners of small coffee plantations and ox carts and oxen for internal traffic, wear coarse cloth coats, drill or cotton trousers, and straw or felt hats. Most of these people go barefooted.

The houses of the wealthy have all modern conveniences. Those of the poorer classes are nearly comfortless. They are mostly low and built of adobes, with a roof of tiles, and are arranged in regular streets crossing each other at right angles. The public buildings are spacious and ornamental.

Among the principal buildings in San José are the New National Theater, in which about 1,000,000 pesos was invested; the National Palace, the Palace of Justice, the Executive Mansion, the Episcopal Palace, the National Distillery, the Market, the University, the High School for Young Ladies, the High School for Young Men, the Custom-house, the Mint, etc.

The city possesses charitable institutions, such as hospitals, orphan asylums, insane asylums, etc., all under the management of corporations and associations constantly laboring for their improvement. The cemeteries are under the supervision of charitable associations. There are several parks, a museum, a public library, and scientific, legal, medical, literary, and musical societies, an international club, and a German club, etc.

The streets are mostly macadamized or paved with stones and lighted by electricity. Nearly every city is well supplied with water, conducted through pipes.

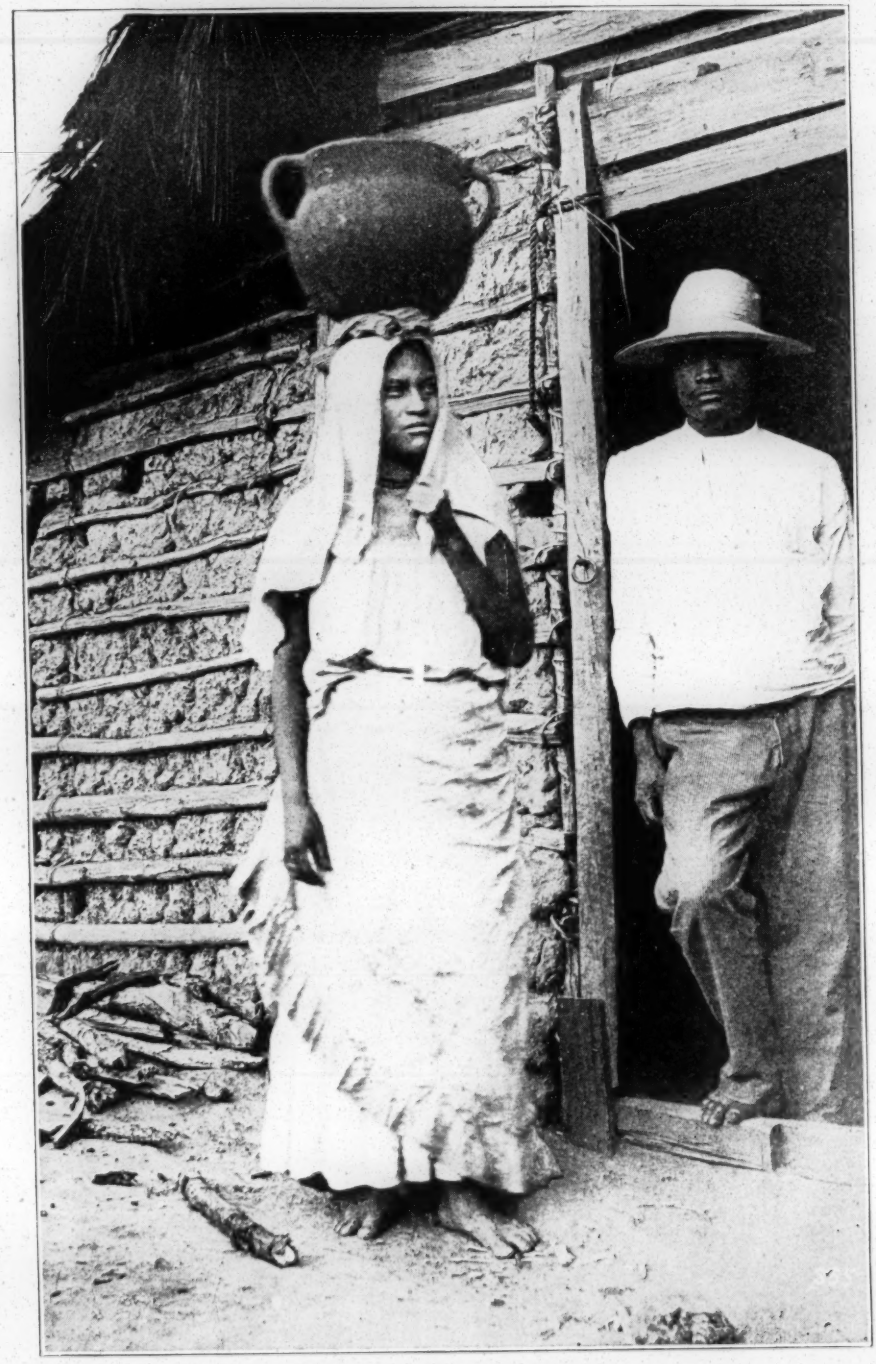
The food of the poor comprises meat, beans, corn, rice, tortillas, and plantains.

Saturday is the especial market day of the cities, and from sunrise till noon the market places are crowded with sellers and buyers. Here can be found all kinds of vegetables and fruits—potatoes, corn, beans, coffee, tobacco, sugar, cheese, meat, and other food, besides earthenware, hammocks, hats, rebozos, charcoal, etc.

The population of Costa Rica is estimated to be 330,000, of whom about one-third, or 31.42 per cent, are able to read or write.

GUATEMALA

Guatemala, writes Charles M. Pepper, is a fascinating country for the traveler and visitor. Antiquarians, deep delvers in the majestic monuments of the long-forgotten past, seek in the myths, the traditions, the temples, and ruins the riddles of prehistoric civilization. Modern tourists, traveling, as they will be able to do within a short time, by railway from New York or San Francisco to the very heart of Guatemala, may lose themselves in admiration of the sublime scenery, the lovely landscapes of valley and mountain, lake and forest (the Indian name for Guatemala means abounding in trees), volcanic caps, giant outlines, and cloud-clad craters. Everywhere they will encounter that diversity which is the chief attraction of natural scenery. They will find also superimposed on the prehistoric Indian civilization the charm of Spanish



Native Types—Honduras

architecture, customs, character, and institutions.

Men of the stamp of President Estrada Cabrera, who are engaged in the material upbuilding and the political progress of the country, may prefer to talk of its agriculture and commerce, its opportunities for the energetic and resourceful people of the northern regions, rather than to discuss its picturesque ruins and its fascinating history. Yet they would not have these subjects neglected. Hence the traveler and the tourist always are welcome, and whether they be deeply learned scientific investigators or mere birds of passage seeking novelty, every provision is made to aid them in their travels.

A FAMOUS SPANISH CAPITAL

Mr William E. Curtis, in his interesting book, "The Capitals of Spanish America," gives the following description of the great city built by the Spaniards:

"Antigua, as it is now called (properly old Guatemala), was not only the scene of wealth and influence and the commercial metropolis of the country, but the home of the most learned men of all Spanish America; the seat of great schools of theology, science, and art; for two hundred years the Athens and Rome of the New World; the residence of the university as well as the inquisition, and the headquarters of those untiring apostles of evil, Jesuits. The population is said to have been about one hundred and fifty thousand. It is not known that a census was ever taken, and this estimate is based upon the size of the city and the number of inhabitants its ruined walls could have contained. It is situated in the center of a great valley, between the twin volcanoes Agua and Fuego, and, as the old Spanish chroniclers used to say, had Paradise on one side and the Inferno on the other. The beauty of its position and the richness of the adjacent country, the grandeur of the scenery that surrounds it, have called forth the most extravagant admiration from travelers, and have made the theme of the native poets."

In 1773 a fearful earthquake destroyed the city, leaving "the most extensive collection of ruins that can be found in this hemisphere. From a tower of the cathedral one can see on either side the ruins of many churches, monasteries, convents, and miles of public and private residences, large and costly, some with walls still standing, liberally ornamented with stucco or carved stone, but roofless, without doors or windows, and trees growing within them.

"The ruins of forty-five churches can be counted, and nearly every one of them had a convent or monastery attached. Some cover several acres, and have cells for five or six hundred monks or nuns. Several of the churches are as large as the cathedral in New York."

BRITISH HONDURAS

In his annual report for 1906, U. S. Consul W. L. Avery, of Belize, writes as follows of conditions in British Honduras:

"The year 1906 has been one of progress, prosperity, and freedom from pestilence; sanitation and rigid quarantine having freed the colony from the yellow fever scourge of 1905, and though the actual death list in that year was small, the depression and material loss were deplorable. The health of Belize and of British Honduras was better in 1906 than for the years preceding 1905. The three great needs of this colony are sanitation, transportation, and cultivation, and the trade conditions will be vastly bettered as these are advanced. Sanitation is nearly perfect in the towns where screening receptacles for water, the filling of swampy lots, and a thorough and continuous cleaning of streets, yards, and drains have resulted in the sound health conditions now enjoyed. Transportation by motor boats on the rivers, new wagon roads to the plantations, and the money voted for a 20-mile tramway from the town of Stann Creek to the Crown lands westward show that industrial needs have received attention. In cultivation and the new acreage devoted thereto the greatest

progress has been made. The application of the United States Fruit Company to purchase 15,000 acres in Stann Creek district for banana planting and the clearing and development of similar areas of 1,000 and 2,000 acres on the Sittee, Temash, and other rivers will result in steamers being able to load entire cargoes in this colony, perhaps in 1907, something they have never been able to do in the history of the fruit trade.

PUBLIC IMPROVEMENTS AND AMERICAN GOODS

"The connection of the Colonial and Mexican telegraph systems has proved satisfactory, and communication has been almost constant. Two years ago telegrams were received by mail, three days *en route* from New Orleans. On May 1, 1906, electric light was used for the first time in Belize. The plant and installation are American.

"The $36,732 worth of machinery imported into the colony is accounted for by electrical demands and the growing popularity of the gasoline motor. There are over thirty motor boats in British Honduras. The longest route, of 140 miles, Belize to Cayo, is now covered in thirty-six hours, the best former time having been five to seven days.

"The United States supply this market with about all packing-house products imported.

"The mail service, Belize to New Orleans, is weekly, and the contract with the United Fruit Company that expired in December has been renewed for five years, with the subsidy of $12,000 per annum, as before. The exports to the United States in 1906 were of the declared value of $817,192, and consisted of the following articles:

Articles.	Value.
Bananas	$178,608
Cocoanuts	85,250
Chicle gum	250,895
Cedar	12,738
Hides	2,237
Logwood	7,042
Mahogany	238,277
Plantains	12,756
Rubber	24,097
Sponges	2,923
Other articles	2,369
Total	$817,192

"The total imports were valued at $2,019,000, of which the United States furnished $1,008,000 worth."

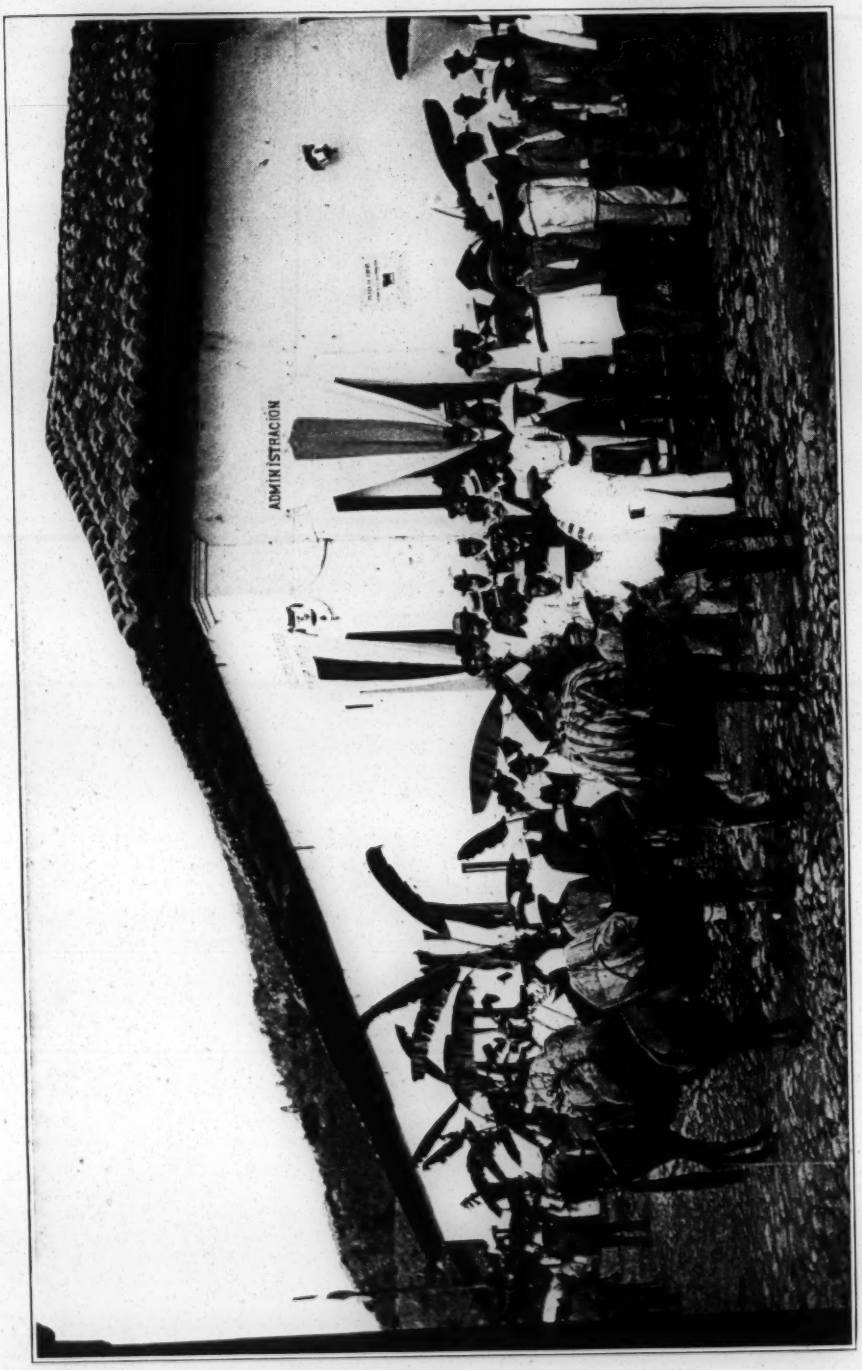
OUR SHARE IN THE COMMERCE OF CENTRAL AMERICA

The following tables are interesting as showing the total annual commerce of Central and South America, and the share therein of the United States:

	Imports.	Share from United States.	Per cent.
Mexico	$84,487,000	$47,530,000	56
Central America	18,080,000	7,733,000	42
South America	444,014,000	58,944,000	13
Total	$546,581,000	$114,207,000	20

	Exports.	To United States.	Per cent.
Mexico	$96,962,000	$65,095,000	67
Central America	25,038,000	10,205,000	40
South America	629,869,000	136,488,000	22
Total	$751,869,000	$211,788,000	28

	Total commerce.	Share with United States.	Per cent.
Mexico	$181,449,009	$112,625,000	62
Central America	43,118,000	17,938,000	41
South America	1,073,883,000	195,432,000	19
Total	$1,298,450,000	$325,995,000	25



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This fine specimen of the largest of all Crustaceans, the Giant Spider Crab, *Kæmpferia* (*Macrocheira*) *kæmpferi* de Haan, which measures somewhat over 12 feet between the tips of its outstretched claws, has recently been placed on exhibition at the American Museum of Natural History by the Department of Invertebrate Zoölogy. This animal is known to occur to a depth of over 2,000 feet in the seas off the coast of Japan. The largest specimen in any collection is said to be that in the British Museum. It has a spread of 18 feet. Even larger specimens are, however, occasionally captured. One is recorded to have had a spread of 22 feet. The specimen in the American Museum is from Miura-Misaki, and was secured by Professor Bashford Dean, of Columbia University.

PEARY TO TRY AGAIN

MORRIS K. JESUP, president of the Peary Arctic Club, sends the Magazine the following statement:

The Peary Arctic Club, at its recent meeting resolved unanimously to place the *Roosevelt* on the docks for a complete outfit, and to thereafter tender the same to Commander Robert E. Peary for another attempt to be made by him to reach the North Pole. The club has taken this action upon reports furnished by Commander Peary, and believes that he will be successful. They have entire confidence in this gallant and intrepid American, and share in the pride which must animate the American people to see this effort, which the club believes will be the final one and the planting on the North Pole the American flag.

The steamer *Roosevelt* has not been structurally injured by the last voyage, and when repaired will be equally, and perhaps even more, able than when she started north in 1905.

The Peary Arctic Club asks the aid of those who have heretofore contributed, as well as the coöperation and aid of all or any who feel an interest in this patriotic enterprise. The expense of the expedition, it is estimated, will be one hundred thousand dollars, and it is hoped this amount will be contributed by the many, and not the few, as heretofore.

Subscriptions may be sent to President Henry Parish, New York Life and Trust Company, No. 52 Wall street, treasurer.

MORRIS K. JESUP,
President.

At a meeting of the Board of Managers of the National Geographic Society on March 7, President Willis L. Moore in the chair and the following members present, Messrs Charles J. Bell, Alexander Graham Bell, F. V. Coville, Charles Denby, A. J. Henry, C. Hart Merriam, General John M. Wilson, Gilbert H. Grosvenor, and F. B. Eichelberger, the following resolution, proposed by Dr Alexander Graham Bell and seconded by General John M. Wilson, was unanimously adopted:

Resolved, That $1,000 from the Research Fund of the National Geographic Society be subscribed to the Peary Polar Expedition of 1907-1908.

In forwarding the amount President Willis L. Moore stated that the National Geographic Society wished to show its appreciation of the important scientific and geographical work performed by Mr Peary during the past twenty years in the Arctic regions, and its hope that he may complete his exploratoins to the north of Greenland and Grantland by the conquest of the Pole.

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graphical History, which we quote below.

* "RUMANIA.—A limited monarchy of eastern Europe. Area, 51,098 square miles; population, 5,912,520. Between 43° to 48° north latitude and 23° to 30° east longitude. Capital, Bucharest; population, 283,145; Jassy, 78,611; Galatz, 63,987. Most of the country is a well-watered plain, with skirts of the Carpathians only in the west and north. The Danube is the chief river, navigable throughout, but of its tributaries only the Pruth is navigable for steamers and the Sereth for rafts. The climate is continental because the country is open to the northeast. Seventy-five per cent of the people are farmers, but primitive methods still prevail. The soil is very fertile, and all products of the temperate zone, and even rice, are raised. The chief crops are maize (the staple food), wheat, barley, oats, rye, tobacco, and wine, all produced in excess of the demand. More maize is raised than in any other country of Europe. Domestic animals are raised in large numbers. The mineral wealth is great, but only petroleum and salt are worked extensively. Petroleum byproducts are used for fuel on railroads, steamboats, and in factories. Manufactures are primitive and all the finer products must be imported. Flour mills, distilleries, and tobacco works are the chief industries. Foreign capitalists own all important manufacturing enterprises, so that the Rumanians derive little profit from them. Races: Rumanians, 400,000 Jews, 200,000 Gypsies, 85,000 Slavs, 40,000 Germans, 30,000 Hungarians, 8,000 Armenians. Religions: Greek Orthodox, Roman Catholic, Protestant, Israelite, and Mohammedan. Grain is three-fourths of the exports and imports are mainly textiles and iron goods. Foreign trade (1902): Imports, $54,686,000; exports, $72,340,000."

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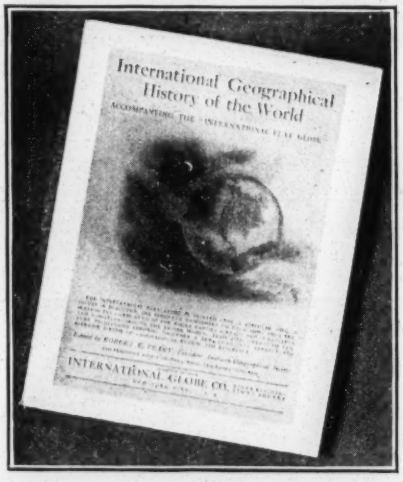

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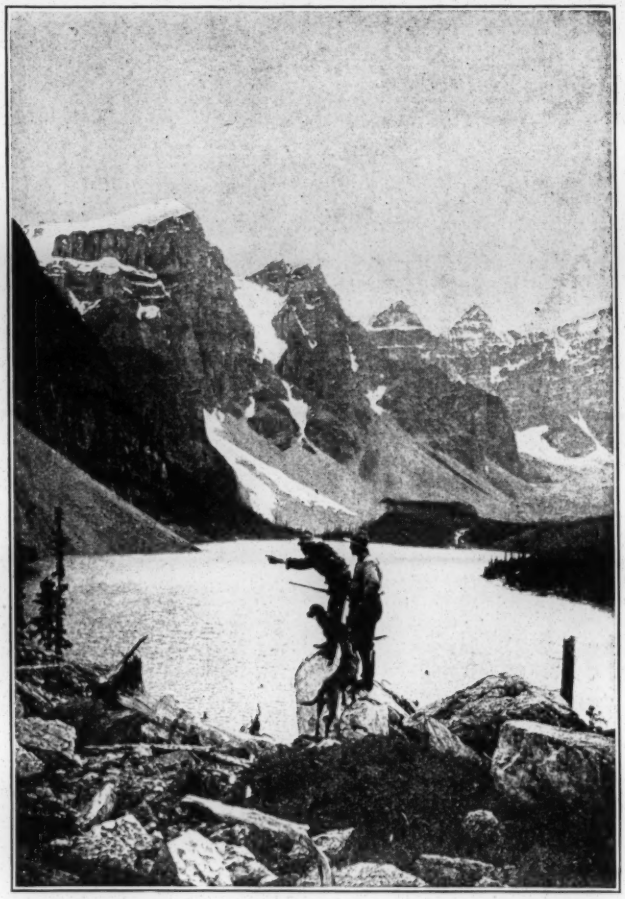

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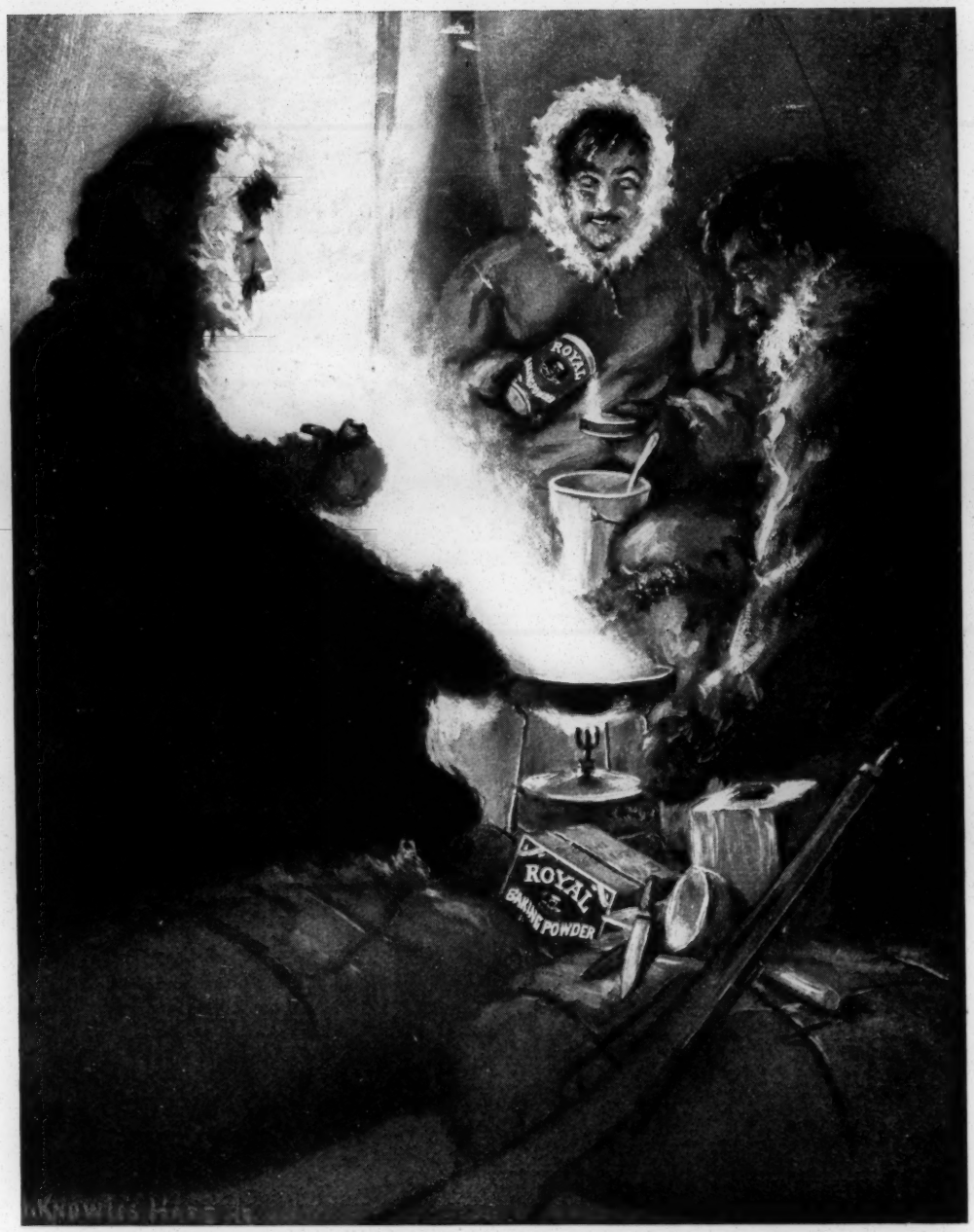

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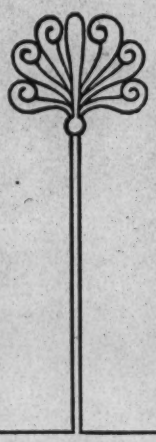

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